ACTA ELECTRONICA UNIVERSITATIS LAPPONIENSIS 254

Nicholas E. Rowe

‘Poster, poster, on the wall; were you even there at all?’

A mixed method research into the efficacy and perceptions of conference poster presentations

LAPIN YLIOPISTO
UNIVERSITY OF LAPLAND

Acta electronica Universitatis Lapponiensis 254

NICHOLAS E. ROWE

'Poster, poster, on the wall; were you even there at all?' - a mixed method research into the efficacy and perceptions of conference poster presentations

Academic dissertation
to be publicly defended with the permission of
the Faculty of Education at the University of Lapland
in the Kaarina-sali auditorium on 17 April 2019 at 12 noon

LAPIN YLIOPISTO
UNIVERSITY OF LAPLAND

Rovaniemi 2019

University of Lapland
Faculty of Education

Supervised by
Professor Satu Uusiautti
Professor Heli Ruokamo

Pre-examiners
Professor Heikki Silvennoinen of the University of Turku
Professor Roy Evans of Brunel University, London

Opponent
Professor Päivi Atjonen of the University of Eastern Finland

Layout: Taittotalo PrintOne

Acta Electronica Universitatis Lapponiensis # 254
ISBN 978-952-337-139-2
ISSN 1796-6310, no 254

Permanent address of publication: http://urn.fi/URN:ISBN:978-952-337-139-2

Dedication

This thesis is dedicated to all those who have diligently stood by their conference posters, hoping that someone would stop and engage with their work. I hope it makes a difference, and that our conference activities will attract more attention and value in the future.

Rowe, N. '*Poster, poster, on the wall; were you even there at all?*' - a mixed method research into the efficacy and perceptions of conference poster presentations. Rovaniemi: University of Lapland, 2019, pp.197. Acta Electronica Universitatis Lapponiensis # 254. ISBN 978-952-337-139-2. ISSN 1796-6310, no 254

Abstract

Conferences are generally acknowledged to be a well-established activity of academic, scientific and professional (ASP) practice. However, there is no established mainstream field of conference learning, and the literature and opinion on the topic is scant, and thinly dispersed across a wide spread and uncollated multi-disciplinary literature. This thesis looks to lift the lid on this much passed-over area of ASP practice, and in particular its role as a medium of information dissemination and knowledge transfer. Specifically it examines the role, efficacy and perception of poster presentation as a continuing education tool, and as a medium of scientific communication.

The thesis begins by exploring the use of posters in conference and educational settings, and establishes their historical precedent. Poster presentation evolved as a means to allow more people to present their work, but over time the numbers of conference posters being presented have increased exponentially, and the mass of information that is made available in poster format has become unmanageable. The few studies that have examined the motivations of conference attendees have placed education (in the form of disseminating and accessing information) as the prime stated reason for attending conferences, closely followed by a wish to network with peers in their professional communities. The fields of continuing education and professional development actively recognise conferences as learning opportunities, and higher education is a consistent reference point in conference literature, with many ASP conference delegates either employed or enrolled in higher education institutions, or following professions that are grounded in higher education and training. However conferences as a site and means of learning are neglected as an area of academic study, and there is limited research that examines their educational efficacy.

By way of four sub-studies, this research looked to answer the following overarching research question: *What is the effectiveness of academic and scientific poster presentations, and how do academics perceive their importance in knowledge transfer?* Sub-Study I carried out a state of the art literature review (51 included studies) to determine the effectiveness of poster presentations on knowledge transfer. Sub-Study II expanded this enquiry and employed an enhanced informetric mapping review that presented quantitative data on poster presentation literature from a total of 249 databases and a comparative academic search engine. Sub-Study III employed

a mixed-method design survey exploring conference delegate perceptions of poster presentation, using open- and closed-ended questions among conference participants (N=37), emerging and predetermined approaches to thematic formation, and quantitative and qualitative data collection and analysis. Sub-Study IV conducted a series of mixed-method web-based expert interviews (N=16) to explore delegate motivations and needs for conference attendance and their perceptions of poster presentation, using open- and closed-ended questions, emerging and predetermined approaches to thematic formation, and quantitative and qualitative data collection and analysis.

The findings are presented in two main themes: *The history and research on the efficacy of poster presentations*, and *Conference delegates' motivations and their evaluations of poster presentations*. Sub-Study I found no evidence that posters were effective as standalone media in facilitating knowledge transfer, be it through an increase in knowledge, change in attitude or behaviour. This runs contrary to the routine poster practices that can be seen at many conference events, where poster presentation is perceived as an established way of sharing knowledge, and as having to function as a standalone entity as well as a presented medium. As such, a dichotomy was seen to emerge whereby posters were being presented with an aim to inform and generate knowledge, yet the available research and theory indicated that this would be unlikely to be achieved using conventional poster practices. However, the study also showed a paucity of foundational research. Sub-Study II revealed the massive global scope of poster presentation, with returns seen from every discipline and continent. Medicine was seen as the largest contributory discipline, outpacing its nearest rivals by some 70%. However, aside from a very limited amount of published research on poster presentation, it was observed that over 99% of the returns led only to a title or abstract mention of poster presentations. Whilst Sub-Study II confirmed massive levels of engagement in poster presentation, it also uncovered literature and opinion that bemoaned its efficacy and value. In order to examine this further, the motivations of conference delegates were explored in two further sub-studies, along with their perceptions of poster presentation. The data from sub-studies III and IV confirmed the motivations of conference delegates to share and disseminate information within gathered conference peer-communities, and that this enabled them to network with like-minded peers. However, there was a clear differentiation between the subjective benefits of conference attendance (which appear to be well catered for), and the way that the objective delegate needs of effective dissemination and recognition are met. The sub-study data reflected a hierarchy of oral presentation being more highly valued than poster presentation, but despite their numeric presence at conferences, this research showed that poster presentations do not serve to disseminate or generate knowledge effectively. Moreover, there is a clear expression that the format of poster presentation is outdated, and needs to be revised in order to increase its value and effectiveness.

The thesis reveals that overall, less than 50% of conference outputs are developed into publications that can be used as an effective knowledge resource by the ASP community. The inability of poster presentations to transfer and generate knowledge is consolidated by the triangulation of theory on knowledge development, and points towards a need to improve the depth of information that is made available, and also the way it is disseminated pre-, per, and post-event. The cost of this inefficiency can be further expressed in monetary terms of multi-billion dollar annual expenditures.

In relation to the opinions expressed in the literature and the voices featured in this study, developments in the informational management of poster presentations (and conference outputs as a whole) would not only increase their educational efficacy, but also increase their functional value as a means of scientific communication. This research offers a reasoned and substantiated argument for conducting immediate research and development in this area. Accordingly, institutions and governmental bodies should consider the massive amounts of human and monetary capital that are committed to conference engagement on a yearly basis, and instigate and support developments that will help to make conference participation and publication a more worthwhile activity, with concrete and demonstrable outputs that support the needs of a globally connected ASP community.

Key Words: Poster presentation; Conference motivation; Conference value; Scientific communication; Continuing education; Mixed-methods research; Knowledge transfer

"*Kerro, kerro kuvastin, kuka näki posterin?*" Monimenetelmäinen tutkimus konferenssien posteriesitysten hyödyllisyydestä ja esittäjien kokemuksista.

Tiivistelmä

Tieteellisiä konferensseja ja niihin osallistumista pidetään vakiintuneina käytäntöinä akateemisen tiedeyhteisön keskuudessa (ASP-käytäntö; academic, scientific and professional). Siitä huolimatta konferenssien aikana tapahtuvaa oppimista tarkasteleva tieteellinen tutkimus puuttuu lähes kokonaan. Aihetta käsittelevä tutkimuskirjallisuus ja keskustelu on vähäistä. Lisäksi keskustelu on hajaantunut eri tieteenaloja koskevaan tutkimuskirjallisuuteen. Tämän väitöskirjan tarkoituksena on valaista tätä paljolti huomiotta jäänyttä ASP-käytäntöä sekä sen roolia tiedon ja oppimisen välittäjänä. Väitöskirjassa tarkastellaan erityisesti posteriesitysten roolia ja hyödyllisyyttä sekä tiedeyhteisön käsityksiä niistä elinikäisen oppimisen työkaluina ja tieteellisen kommunikaation välineinä.

Väitöskirjan alussa tarkastellaan posteriesitysten käyttöä konferenssi- ja koulutusympäristöissä sekä esitellään niiden historiallista taustaa. Posteriesitykset otettiin käyttöön, jotta mahdollisimman moni akateemisen yhteisön jäsen saisi mahdollisuuden esitellä tutkimustaan. Ajan kuluessa posteriesitysten määrä on kuitenkin kasvanut räjähdysmäisesti, mikä on puolestaan johtanut siihen, että niiden sisältämästä tietomassasta on tullut hallitsematonta. Niissä harvoissa tutkimuksissa, joissa on tarkasteltu syitä konferensseihin osallistumiselle, on todettu, että tärkeimpänä syynä osallistujat ovat pitäneet oppimista (tiedon jakamista ja vastaanottamista). Lähes tulkoon yhtä tärkeäksi syyksi osallistujat mainitsivat halun verkostoitua muiden tutkijoiden kanssa heidän ammatillisissa yhteisöissään. Elinikäistä oppimista ja ammatillista kehittymistä tutkivilla aloilla konferensseja yleisesti pidetään oppimisympäristöinä, minkä lisäksi korkeakouluopetukseen viitataan alinomaa konferensseja koskevassa kirjallisuudessa. Monet ASP-konferenssien osanottajat myös joko työskentelevät tai opiskelevat korkeakouluissa tai ovat ammateissa, joiden perusta on korkeakouluopetuksessa ja koulutuksessa. Siitä huolimatta konferenssien rooli oppimisympäristönä ja -välineenä on jäänyt paitsioon akateemisessa tutkimuksessa ja vain vähäinen määrä tutkimusta tarkastelee niiden koulutuksellista hyötyä.

Väitöskirja muodostuu neljästä osatutkimuksesta, joiden avulla etsitään vastausta eri aihealueet yhteen kokoavaan tutkimuskysymykseen: Kuinka hyödyllisiä akateemiset ja tieteelliset posteriesitykset ovat ja kuinka merkittävinä tiedonvälittäjinä akateeminen yhteisö niitä pitää? Ensimmäisessä osatutkimuksessa toteutettiin kirjallisuusarvio tuoreimmasta saatavilla olevasta tutkimuksesta (N=51 tutkimusta). Sen tarkoituksena oli määrittää posteriesitysten hyödyllisyys tiedonvälityksessä. Osatutkimus II laajensi tätä kysymystä käyttäen tehostettua informetristä re-

view-tutkimusta, jossa analysoitiin kvantitatiivista dataa posteriesityksiä käsittelevästä kirjallisuudesta kaiken kaikkiaan 249 tietokannasta ja vertailuja tekevästä akateemisesta hakukoneesta. Kolmannessa osatutkimuksessa suunniteltiin ja toteutettiin monimenetelmäinen kysely, jolla kartoitettiin konferenssivieraiden (N=37) käsityksiä posteriesityksistä. Kyselyssä käytettiin avoimia ja suljettuja kysymyksiä, ennakoimatonta ja ennakoivaa lähestymistapaa temaattisessa kysymyksenasettelussa sekä kvalitatiivista ja kvantitatiivista aineistonkeruuta ja analyysia. Neljännessä osatutkimuksessa suoritettiin sarja monimenetelmäisiä verkkohaastatteluita (N=16), joilla kartoitettiin konferenssivieraiden syitä ja tarpeita konferensseihin osallistumiselle sekä heidän käsityksiään posteriesityksistä. Haastatteluissa käytettiin avoimia ja suljettuja kysymyksiä, ennakoimatonta ja ennakoivaa lähestymistapaa kysymyksenasettelussa sekä kvalitatiivista ja kvantitatiivista aineistonkeruuta ja analyysia.

Tutkimustulokset esitellään kahden pääteeman mukaisesti: Posteriesitysten historia ja niiden hyödyllisyyttä koskeva tutkimus ja Konferenssivieraiden syyt osallistumiselle ja heidän arvionsa posteriesityksistä. Ensimmäisen osatutkimuksen perusteella ei löytynyt näyttöä siitä, että posteriesitykset olisivat hyödyllisiä itsenäisessä välittäjäroolissa ja helpottamassa tiedonsiirtoa, olipa kyseessä tiedon lisääminen tai muutos asenteessa tai käytöksessä. Tämä havainto on ristiriidassa yleisten ja rutiininomaisten konferenssikäytäntöjen kanssa, joissa posteriesityksiä pidetään vakiintuneena tapana jakaa tietoa sekä toimivan paitsi itsenäisenä kokonaisuutena myös suullisena esityksenä. Näin ollen esiin nousi kahtiajako: Toisaalta posteriesitysten tarkoituksena pidetään tiedottamista ja tiedon lisäämistä, mutta silti olemassa oleva tutkimus ja teoria ovat osoittaneet, että tämä tavoite ei todennäköisesti toteudu nykyisillä posteriesityskäytännöillä. Toisaalta tutkimuksessa kävi ilmi myös perustutkimuksen vähäisyys. Osatutkimus II paljasti posteriesitysten maailmanlaajuisen kattavuuden, sillä hakutuloksia saatiin joka tutkimusalalta ja maanosasta. Ylivoimaisesti eniten hakutuloksia saatiin lääketieteestä, noin 70 % enemmän kuin muilta tieteenaloilta. Joka tapauksessa, lukuun ottamatta sitä, että posteriesityksiä koskevan julkaistun tutkimuksen määrä on todella vähäinen, yli 99 % hakutuloksista johti ainoastaan mainintaan posteriesityksen otsikosta tai tiivistelmästä. Toisin sanoen, vaikka osatutkimus II vahvisti posteriesitysten vahvan aseman, se myös toi esiin tutkimuskirjallisuudesta löydettävän ja asiantuntijoiden esittämän kritiikin niiden hyödyllisyydestä ja merkityksestä. Tämän asian lähempi tarkastelu vaati konferenssivieraiden motiivien sekä heidän posteriesityksiä koskevien käsitysten kartoitusta vielä kahdessa osatutkimuksessa. Kolmannesta ja neljännestä osatutkimuksesta saatu tutkimustieto vahvisti sen, että konferenssivieraiden motivaationa toimi tiedon jakaminen ja välittäminen muun konferenssiin osallistuneen vertaisyhteisön kanssa, mikä myös mahdollisti heidän verkostoitumisensa saman alan tutkijoiden kanssa. Tutkimuksessa nousi kuitenkin esiin selkeä ero konferenssiin osallistumisen henkilökohtaisten hyötyjen saavuttamisen (joihin on panostettu ilmeisen hyvin) ja sen välillä, miten vieraiden objektiiviset tarpeet tehokkaaseen tiedonvälitykseen ja tun-

nustukseen täyttyivät. Osatutkimuksen tutkimustiedosta nousi esiin hierarkia, jossa suullista esitystä arvostettiin posteriesitystä enemmän. Huolimatta posteriesitysten yleisyydestä konferensseissa, ne eivät välitä tai generoi tietoa tehokkaasti. Tämän lisäksi tutkimus osoitti, että nykyisessä muodossaan posteriesitys on vanhentunut ja vaatii uudistamista, jotta sen merkitys ja hyödyllisyys saataisiin palautettua.

Väitöskirjan löydösten perusteella käy ilmi, että alle 50 % konferenssiesityksistä päätyy julkaisuihin, joita ASP-yhteisö voi hyödyntää tiedonlähteinä. Myös eri teoriat tiedon kehittymisestä vahvistavat posteriesitysten kyvyttömyyttä välittää ja lisätä tietoa. On tarpeen parantaa esitysten laatua sekä tapaa, jolla niistä saatavaa tietoa välitetään ennen tapahtumaa, sen aikana sekä tapahtuman jälkeen. Tämän tehottomuuden hinta voi rahassa laskettuna nousta vuosittain monen miljardin dollarin kulueräksi.

Tutkimuskirjallisuudessa esitettyjen mielipiteiden sekä tässä tutkimuksessa esiin tulleiden näkemysten perusteella posteriesitysten (sekä yleisesti kaikkien konferenssiesitysten) sisältöjen parantaminen lisäisi paitsi niiden koulutuksellista hyötyä, myös niiden tarkoituksenmukaisuutta tieteellisen kommunikaation välineenä. Tutkimus tuo esiin harkitun ja perustellun väittämän, jonka mukaan aihealue vaatii välitöntä tutkimusta ja kehitystä. Sen lisäksi eri instituutioiden ja valtion virastojen tulisi huomioida se valtava henkilö- ja rahapääoma, joka konferensseille varataan vuosittain, ja panna alulle ja tukea kehitystä, joka tekisi konferensseihin osallistumisesta ja konferenssijulkaisemisesta hyödyllisempää toimintaa, joka konkreettisilla tuloksillaan tukisi myös maailmanlaajuisen ASP-yhteisön tarpeita.

Asiasanat: Posteriesitys; Konferenssiin osallistumisen motiivit; Konferenssin merkitys; Tieteellinen kommunikointi; Elinikäinen oppiminen; Monimenetelmäinen tutkimus; Tiedonvälitys

Table of Contents

Tables and Figures

List of Articles

Sub-Study I

Ilic, D., Rowe, N. (2013). What is the evidence that poster presentations are effective in promoting knowledge transfer? A state of the art review. Health Information and Libraries Journal, 30(1), 4-12. doi: 10.1111/hir.12015

Reproduction permission: 4440241242450 Oct 01, 2018 John Wiley and Sons

Sub-Study II

Rowe, N. (2017). Tracing the 'grey literature' of poster presentations: a mapping review. Health Information and Libraries Journal, 34(2), 106-124. doi: 10.1111/hir.12177

Reproduction permission: 4440250140214 Oct 01, 2018 John Wiley and Sons

Sub-Study III

Rowe, N., Ilic, D. (2015). Rethinking poster presentations at large-scale scientific meetings: is it time for the format to evolve? FEBS Journal, 282(19), 3661-3668. doi: 10.1111/febs.13383

Reproduction permission: 4440250316223 Oct 01, 2018 John Wiley and Sons

Sub-Study IV

Rowe, N. (2018). 'When you get what you want, but not what you need': the motivations, affordances and shortcomings of attending academic/scientific conferences. International Journal of Research in Education and Science, 4(2), 714-729. doi:10.21890/ijres.438394

Reproduction permission: Granted Oct 09, 2018 International Journal of Research in Education and Science

List of Abbreviations

ASP	Academic, Scientific and Professional (author formulation to describe the main groups of conference and poster users)
CE	Continuing Education
CLE	Continuing Legal Education
CME	Continuing Medical Education
CPD/E	Continuing Professional Development/Education
MICE	Meetings, Incentives, Conferences, exhibitions
MMR	Mixed-Methods Research

Acknowledgements

Researching conference poster presentation has been a challenging endeavour, especially given the lack of mainstream attention it has received. I hope that this thesis goes some way to demonstrating its importance, and express my thanks to the following people for their kind engagement and support:

In 2007, Professor Dragan Ilic of Monash University, Australia, shared (a few) glasses of chilled sherry at a conference in Sicily and convinced me of the importance of exploring conferences as a means of scientific communication. Despite this being the only time we would meet in person, we collaborated on a range of presentations and papers, and our work inspired me to adopt scientific communication and continuing/professional education as a main research interest. Dragan – for this (and the sherry), I am extremely grateful.

Pursuing this research continued by way of studying for a PhD, the output of which is this thesis. I would like to thank the University of Lapland for kindly granting me the right to study, and for their scholarship support that enabled me to write up this final work 'away from the day job'. My special thanks goes to Professor Satu Uusiautti who stepped in during the final stages as my supervisor, and guided me through its completion. Her professional and supportive approach have been invaluable, and her positive work approach and work ethic have shown me a 'gold standard' to strive towards in my own educator role. Satu – there is much work to be done, and your guidance and attention to detail transformed the challenge of thesis write-up, to a process of enjoying research and writing once again. Thank you.

I would like to thank Professor Heikki Silvennoinen of the Department of Education in The University of Turku, and Professor Roy Evans of Brunel University, London, for the time and effort they gave over to pre-examining this thesis, and their kind recommendations to award permission for its public defence. Their comments were highly appreciated, and offered welcome perspectives for future research and development. Additionally, I would like to thank Professor Päivi Atjonen of the University of Eastern Finland for taking up the role of Opponent for the defence. Their views and perspectives are highly valued.

Following a PhD is inherently a solo endeavour, especially in any new or emerging field. Conferences are a well-established part of our academic practice, but little explored in the research. I would like to offer my thanks to all those in the research community who have allowed me to express my views, and offered theirs in exchange. In particular, I would like to thank the Research Gate community for reminding me we are a varied and globally connected information society, and for

allowing me to capture a virtual glimpse of how others view the multiple facets of professional academic practice. I would also like to thank those who participated in my interview series, and who took the time to relate their honest and open opinions. Additionally, I would like to thank the conference communities of many disciplines for allowing me to present my work, and for showing interest in this new line of research. Challenging an established facet of practice requires perseverance, but if we do the same thing over and over, we are unlikely to see any improvement or different results. Thank you all for your recognition that it is time for change.

I would like to thank Professor Mauri Ylä-Kotola, Rector of the University of Lapland for his generous award of the scholarship grant that supported the finalisation of this thesis.

Finally, I need to make a few personal acknowledgements. Despite never really 'getting' what my research is all about, my wife and son have given 'real-life' support, especially at times when the end was difficult to see. Also, a special thanks goes to my cat who has been a faithful companion whilst I tapped, searched, read and thought – you have been fully worth the €40 we spent on you all those years back ;-)

1. Introduction

1.1. Background of the research

I am a university educator and academic, originally from the UK. Following a 20 year career in registered healthcare, I transferred to the higher education sector, teaching a wide range of clinical subjects and multi-disciplinary programs in communication. My teaching qualifications are based in adult education.

I first started to research poster presentation in 2008, following my own first experiences of presenting at an international conference on evidence-based medicine. Since then I produced a number of published conference presentations and poster-related works (Rowe & Ilic, 2009a; 2009b; Rowe & Ilic, 2011; Rowe, 2012). The research in these papers raised a paradoxical situation, whereby on one hand posters seemed to be a prevalent and popular medium of sharing knowledge in the conference environment, but on the other hand, they seemed to attract mixed axiological value attribution from their users (presenters and viewers). There was no central reporting or collation of poster information, and much of what had been written on posters was based on opinion and focused on the compilational aspects of poster design (see Sub-Study II for a full review, and Rowe 2017a (pp. 153-161) for a chronological listing of key poster literature that reflects this period). It was assumed at the time that as academic, scientific and professional (ASP) conference events were a commonplace means of presenting knowledge and facilitating networking among peers, then the transfer or dissemination of knowledge would be the prime motivation for poster presentation (see Rowe & Ilic, 2009a). Knowledge presentation was also the central driver featured in the compilational literature surrounding conference posters, but the wider poster commentary and opinion tended to be generalized and less clearly oriented.

Conferences are an established feature of continuing education practices, in that they expose delegates of all levels to new and emergent knowledge. Although conference learning is not yet an established field within educational studies, the practical links to education are clear. Firstly, attendees (especially medical and education professionals) can accrue Continuing Professional Development/ Education (CPD/E) points and certificates of attendance that can be used to show their on-going development for professional registration purposes. Secondly, the limited motivations literature of the conference industry shows 'education' (in the forms of education, sharing knowledge, holistic learning and professional education) to be the primary motivation for conference attendance (see Appendix

1 of Sub-Study IV for a content analysis of 1993-2017 conference literature). Thirdly, there is a clear connection between the attendee backgrounds of those who attend conferences, and the higher education base that either grounds their work as researchers/educators, or provides the educational base for their professional occupation. However, there is very little research that investigates what we do at conferences beyond a reporting level.

Accordingly, this thesis focuses on a prominent but unreported area of conference activity, and presents an investigation of poster presentation in terms of its potential efficacy and how it is perceived.

1.2 Poster usage in conferences and educational settings

1.2.1. Conference evolution and purpose

Conferences have been in existence since 1644 (Cheesman, 1975), pre-dating the earliest published journal (de Hédouville, 1665) by 11 years. During the 19th century, universities started to provide events for the specific dissemination of information within academic circles (Rogers, 2008). Little is recorded about these early events, but they rapidly became an accepted part of higher education and professional practice, and are visible in most of the major disciplines from the 1950s onwards (see Sub-Study II). During the 20th century, trade and industry began to invest heavily in meetings and started to host events aimed to develop staff and sales (Rogers, 2008; Shone, 2009). At both trade and academic meetings, established and trainee delegates get together to share information, interact, and discuss matters of professional interest (see Rowe, 2017a for full discussions). ASP conferences are a client sector of the 'MICE' (meetings, incentives, conferences, exhibitions) industry, however ASP conferences are poorly differentiated from other meetings and events types. The MICE industry forms the de-facto field in which conferences are studied as a specific activity (see Table 2 in the literature review section for a full breakdown), however the focus remains firmly rooted in the more general perspectives of event management. Within the MICE industry literature, Breiter and Milman (2006) found that no specified user group studies had been conducted, and despite conference outputs (i.e. conference papers and abstracts) being widely spread throughout the multi-disciplinary literature, in the education discipline there appears to be no distinction of conferences as providing a unique field of learning. In relation to the purpose and function of conferences, Grant (1994a) found that no studies on conference delegate motivations had been conducted prior to 1993.

The term 'conferences' can be broadly used as an umbrella to describe a variety of meeting types, ranging from congresses, colloquia, conventions, seminars and meetings. No formal typology of conferences has been offered in the scholarly literature, however, IAPCO (1992) produced a guide to the terminology of

the MICE industry which provided definitions of event types (pp. 54-60). Of these, ASP communities can be seen to engage in meetings, lectures, conferences, conventions, congresses, seminars, symposia, colloquia and study days. Although they will be involved in other forms of conferences, it is these that form the core of ASP conferencing practices, and which involve attendance and the presentation of research, together with interactive activities such as workshops, forums, round tables, debates, and also social networking opportunities. Although some research has examined the factors which motivate, assist or prevent delegates from attending conferences and conventions (see Appendix 1 of Sub-Study IV), this has been predominantly from an event organiser's perspective. Additionally, most work on the topic has been seen to be of 'opinion level' and fails to meaningfully address participant perspectives (Neves, Lavis & Ranson, 2012).

When viewing the literature, 'education' is seen to be the most prominently expressed motivation for attending conferences, and ASP conference events are held to facilitate knowledge dissemination, exchange and transfer. However, it is puzzling that conference practices have not been given more research attention. Grant (1994b) explored the factors which influenced the selection process of meetings (including, but not restricted to conferences), and found education to be the primary motivation for attendance. This finding was also confirmed in future studies (Rittichainuwat, Beck & Lalopa,2001; Severt et al., 2007; Huang, Davison & Gu, 2008; Yoo & Chon, 2008; Severt, Fjelstul & Breiter, 2009; Kim, Lee & Kim, 2011; Neves, Lavis & Ranson, 2012; Lee & Min, 2013; Kordts-Freudinger, Al-Kabbani & Schaper, 2017), but the educational mechanisms and efficacy of these events have not been explored. There are also positive educational and developmental motivations expressed by the ASP community (e.g. Pain, 2017; GAI, 2018; IEREK, 2018; Schneider, 2015). Tomaszewski and MacDonald (2009) discuss the benefits of attending conferences to gain subject knowledge and to interact with field experts, however many of the articles that discuss conference benefits are based on opinion (e.g. Natarajan, 2009; Lindsay, 2018; Hickson, 2006; Denard Goldman & Jahn Schmalz, 2010), and often lack any demonstration of the positive outcomes having been achieved. Terms such as 'academic conference', 'scientific conference' 'research conference', etc. are commonly seen, but their potential delegate body may vary in background and profession. For example, 'academic conferences' may be held for an academic audience, but attendees may also come from professions outside academia. Of special note are the huge professional and field-specific congresses that are held (see Table 1 for examples), attracting professionals, academics and students who will attend and also present their work in large numbers.

Table 1. *Examples of large-scale conferences held in 2017-2018.*

American Chemical Society Meeting (April 2017)	18,917 attendees (3,000+ undergraduates) 5,700 posters
European Society of Cardiology Congress (August 2018)	31,000 attendees 4,500 abstracts + 500 expert sessions
Neuroscience 2017 (November 2017)	30,000 attendees 14,700 posters
American Geophysical Union Fall Meeting (December 2017)	24,000 attendees 20,000 oral and poster presentations
American Educational Research Association Meeting (April-May 2017)	15,200 attendees 10,900 oral and 158 poster sessions (804 posters)

It is important to note that in line with the IAPCO (1992) definitions, in contrast to events and fairs that have a strong element of exhibiting products or services (p. 56), ASP conferences (and their sub-types) serve to '*gather people in one place*', '*facilitate the exchange of information*' (p. 54), '*provide* [&] *deliberate information*' (p. 55), and to facilitate '*training or learning*' (p. 56). As a term, 'ASP conference' is a suitable way to differentiate the events that academic, scientific and professional groups will attend from the wider scope of the MICE industry, and one which reflects the professional nature of its user-group. Especially, it underlines their active intent to gather, present, exchange and generate information, rather than be subject to a more passive exposure to information such as that gained when visiting a museum or exhibition.

1.2.2. The use of posters in ASP conferences

Conference attendance increased dramatically from the 1960s, especially coinciding with the deregulation of airlines and the emergence of more affordable air travel. With this came an increase in the numbers of those who wished to present, and poster presentation was introduced as an alternative to podium presentation. No records are available from this time, but it is possible that as people were undertaking longer journeys to attend conferences, they wanted to make the most of their time, and perhaps show a better return for their investments of time and money. Harte (1974, p. 2087) described poster presentation as a '*lineal descendant*' of the scientific exhibits which were seen at conferences in the 1940s–1950s, but they seemed to disappear from use until they re-emerged some 20 years later. Rowe (2017a, p. 5) offers an early example of a display board dating from 1946, and the first emergence of posters during international conferences is seen to occur in 1969 (FEBS 1969, reported by Rowe, 2014b; 2014c). Poster presentation rates increased exponentially from this time (see Sub-Study II for an indicative picture). Maugh (1974) describes

a biochemistry meeting in which posters accounted for 22% of the 2,200 papers being presented, and as illustrated in Table 1 and the sub-studies of this thesis, the numbers of poster presentation abstracts that are reported in the literature indicate that poster presentation is now the most numerically prevalent form of conference presentation. However, due to the lack of centralised data on conference activities, it is not possible to offer any specific quantifications as to how many poster presentations are undertaken, their ratios in relation to oral presentation, or the numbers of delegates who present. What can be said, however, is that these numbers are likely to be significant, as evidenced by the reports and published outputs of individual events (see Sub-Study II).

Echoing the dearth of conference-related research, poster presentation is also an under-studied area. This is made evident in the poster bibliography offered by Rowe (2017a, pp. 153-162) which offers a full account of key poster literature from 1939-2017. The early literature considers posters as a medium of *scientific communication*, i.e. a means by which ASP professionals formally disseminate, review and generate knowledge within their own community (see e.g. Hurd, 2000; Fjordback Sandergaard, Andersen & Hjorland, 2003), and in contrast to the process of *science communication* that looks to disseminate and transfer findings to the public domain. Early critiques have been offered as to the efficacy of conference outputs (UNESCO, 1963) and posters (Schmidmaier, 1981) as media of scientific communication, but these seem to have been largely overlooked.

There are reports and studies that reflect posters being used as an educational medium. As early as 1939, Riley considered the way that posters are used in classroom settings to visually present information. She asserted that the choice of posters as a presentational medium needed no defence, and that posters may represent '[...] *either a good idea crudely or inartistically presented, or a shallow idea beautifully executed*' (p. 157). Riley also notes that when a mass of posters is accumulated (she offers an example of 200 posters gathered from pupils towards a project), then such numbers cannot be properly displayed, nor can they be properly integrated within a class study or discussion. More recently, Duchin and Sherwood (1990) discuss posters as visual aids to either present information independently, or to support other presentation formats. They view posters as needing a concise but constant message, and being able to facilitate interaction with the viewer. Specifically, they counter the view that posters are 'passive displays' (p. 206) in that viewers are encouraged to stop in front of the poster, digest and evaluate the displayed content, and recall the message. Author presence enhances this interaction, and there is differentiation between the less formal use of posters in educational programs and their more formal use and structures in conferences and scientific meetings. From a domain perspective, the commentary and advice offered in this paper is situated within the continual educational field of Nursing. Also, Fowles (1992) discusses posters as an evaluation tool for nursing research students, and in a similar setting,

Bracher, Cantrell and Wilkie (1998) view posters as helping students to develop and use their skills of enquiry, critical analysis, and disseminating findings. Broadening the consideration to a multi-disciplinary perspective, MacIntosh-Murray (2007) views the conventions of conference poster presentations' 'social practices' as being entwined in the academic apprenticeship of health disciplines, and that posters can be seen to be a common means of communicating research across scientific disciplines (p. 347). However, she notes a '*hidden curriculum*' (p. 367) that reflects the professional attitudes and academic cultural values that relate to conference poster presentations when compared to oral presentations. Specifically, posters can be seen as 'consolation prizes' (for having not been accepted for an oral presentation) or simply dismissed as 'second class'. Taking viewpoints and observations like this into account; when looking at how posters fit into the conference setting, MacIntosh-Murray (2007) equates them to a '[...] *middle child seeking the attention given to their more favoured conference siblings, the oral presentations and papers, and the meals and breaks*'. Thus, despite the educational motives of poster presentation appearing to be generally accepted, observations like these which call into question whether they have achieved this, either in perception or in practice.

Notably, there is little examination of the mechanisms and outcomes of poster presentation, and any critique tends to be opinion-based (e.g. Salzl et al., 2008; Goodhand, Giles, Wahed, Irving, Langmead, & Rampton, 2011; Gordon, Darbyshire, Saifuddin, & Vimalesvaran, 2013), and is scattered among the multi-disciplinary literature.

1.3. Ontological and Epistemological Assumptions

This thesis identifies as following an interpretivist paradigm, and therefore the ontological position adopted is one of relativism (Scotland, 2012). Ontology is the study of 'being', or 'what is', however, as Scotland (2012) notes: '*Researchers need to take a position regarding their perceptions of how things really are and how things really work*'. There is little foundational research in the fields of conferences or poster use, so this thesis will attempt to portray 'what is', reflecting the published views and perspectives of those who organise and use conferences. However, until further research is undertaken, it is impractical to claim any comprehensive ontology that reflects the wide multi-disciplinary base of poster users.

Conference ontology

Despite their massive levels of global engagement (see Sub-Study II), there has been remarkably little investigation of conferences outside of a meetings industry perspective. Conferences manifest as gatherings where peer communities present and access the newest research in their fields (knowledge dissemination and transfer),

and attendees have the opportunity to discuss topics of mutual interest and engage in face-to-face networking. However, there has been little investigation as to their mechanisms, objectives or effectiveness. The meetings industry is rooted in the tourism sector, and revolves around the planning of 'events', within which lie ASP conferences. In hosting these events, the meetings industry (and conference organisers as a whole) can be seen as providing a service, yet investigations as to whether their events are effective seldom extend beyond a superficial level of delegate satisfaction (Neves, Lavis & Ranson, 2012). In providing any similar service, market research is seen as a key initial stage in predicting service and user value (Vargo, Maglio, & Akaka, 2008). Yet with ASP conferences, this does not appear to have taken place. 'Education' is the key attendance motivation expressed in conference literature (see Appendix 1 of Sub-Study IV for an analysis), yet how or whether this takes place has not been explored. As identified above, the ASP sector is massive. Moreover, as conference outputs form the single largest medium of scientific communication and have a multi-billion annual expenditure in any currency (Rowe 2017a, 2017b), such a lack of directed research in this area is truly surprising. The vagueness of the conference literature is reflected in a literature review on '*Identifying and analysing existing research undertaken in the events industry*' (Bowdin, McPherson & Flinn, 2006), with conferences being given only brief mention within the overall events context (pp. 20-21). The review mentions (p. 36) that: '*The events industry covers a broad spectrum of sectors, making it almost impossible to estimate the size or worth of the industry without further detailed research to gather labour market intelligence and establish a database for the industry*'. However, all of the published reports on the value of the events industry cite multi-billion annual economic contributions, including the US events industry ($US 280 billion: PWC, 2014), UK (£19.2 billion: UKCAMS, 2016) and Australia ($A 28 billion: BECA, 2015). Thus, whilst conferences are clearly a present and significant phenomenon, their nuanced meanings, non-economic values and perceptions are unclear, and therefore any ontological assumptions of value or function are difficult to establish.

The historical ontology of conferences is a little easier to describe, and their origins as places for exchanging knowledge and debate stem back to ancient times. Bowdin et al. (2006, p. 20) offer the Convention Industry Committee definition of conferences as a '*Participatory meeting designed for discussion, fact-finding, problem solving and consultation*'. Such a loose definition can be applied to many historical accounts of 'conferencing', but it does little to inform the area of study. Indeed, spurious attempts have been made to link the modern conference industry to the dark ages and beyond, even going to the extent of claiming that King Arthur's mythical 'Camelot' existed, and so offers archaeological proof that ancient Roman debating cultures transcended the Dark Ages and entered into modern history (see Shone, 1998, p. 4-5). The etymology of 'conference' is indeed old, originating in the Latin word '*conferre*' meaning to bring together, and passing through French

(*conférence*) and medieval Latin (*conferentia*), to early English uses meaning to 'confer'. Thus, the modern use of the term conference as a description of an event that collects people in one place to discuss issues is particularly apt. The earliest known conference proceedings dates from 1644 (*Conference des Fauconnieres* cited Cheesman, 1975), and nowadays, conferences are an integral element of academic, scientific and professional practice, and generally accepted as places where peer communities gather to access and present knowledge, engage in professional socialisation and networking, and to a lesser degree, to take part in workshops, job interviews, etc. (see Sub-Study IV). However, a genuine ontology for conference practices, conceptions and activities has yet to be established.

Poster ontology

Until recently, poster presentations were also relatively unexplored in regard to their development, objectives, perceptions and efficacy (see chronological bibliography in Rowe, 2017a, pp. 153-161). Posters were introduced at academic and scientific conferences in order to provide presentation opportunities for those who could not be accommodated in podium sessions. The earliest form of poster presentations as demonstration aids stem from the 1940s, but their use at conferences is not documented until 1969 (see Rowe, 2017a, pp. 3-6 for a full historical discussion). These first sessions had only an average of 13 posters on display (see Sub-Study III; Rowe, 2014b), and presenters had quite positive experiences. However, the size of poster sessions rapidly increased, and some early conceptions of poster sessions were described by Maugh (1974, p. 1361):

> *'One large meeting room (or more) is filled with bulletin boards on which the participants place graphs, diagrams, data, pictures, and a small amount of text to illustrate the main points of their presentation. The participants then remain with the display for a set period-generally 1 to 1½ hours-to expand on the material and answer questions. Visitors to the sessions can either wander through as in a museum or go directly to the papers that interest them.'*

Telling here is the comparison of browsing exhibits in a museum, and at the conference described by Maugh, some 500 presentations (22% of the total) were in poster form. What had initially been seen as a viable alternative to podium presentation and one that promoted delegate engagement, now became seen as something of a 'runner up' achievement. Eisenschitz, Knox, Oppenheim, Richards, & Wittels (1979, p. 236) noted the importance of poster sessions and observed that some 10 years after their international inception, there had been no studies as to their place as a medium of scientific communication. Also, in the small study they reported, their respondents felt that posters did not carry as much prestige as an oral conference paper. One of the early compilational issues raised was that small texts

meant posters could only be seen at close range. However, as posters developed and sessions became larger, the visibility of posters (and hence their ability to attract attention) became more important, especially considering that the concentrated masses of posters that are often encountered at large scale conferences tends to reduce the visibility of individual works (e.g. Salzl et al., 2008; Goodhand et al., 2011; Gordon et al., 2013; Zarnetske & Zarnetske, 2015 – see also Appendix 3 of this thesis).

At the beginning of this study, a situation existed where poster presentation was to be seen as a highly popular conference activity, yet a growing number of voices complained of it not being effective in attracting attention or helping to disseminate knowledge to a meaningful audience, beyond the level of chance encounter. From a hierarchical ontological perspective, posters were seen as a common form of conference presentation, but one that ranked below oral presentation and which was suited to more 'junior' presenters. However, this was a distinction that seemed to have evolved as a result of organisational and informational management practices, and not one that reflected the original aims of developing a more intimate and accessible form of knowledge exchange. In this way, the practices of oral and poster presentation at conferences can be seen as ontological formations, whereby oral presentation holds perceptual primacy over poster presentations as a dominant performance category (in line with James, 2006), despite the fact that posters are numerically more prevalent.

Epistemology

Based on the interpretivist approach taken in this research, its epistemic position is one of subjectivism (Scotland, 2012). The way posters and conferences are perceived will be shaped by our individual experiences of the phenomena, and given their changing and variable nature, these perceptions will likely be inconsistent and generalised. In this regard, and especially considering the pioneering nature of this research, the formulation of original opinions will understandably be seen as somewhat subjective, although the triangulative approach adopted in this thesis will help to formulate a full academic argument. Reciprocally, however, responses to this argument will initially be opinion-led, but as research develops and informs our ontological and epistemological perspectives, then these too will become more robust.

As with the previous ontological perceptions of what conferences and posters 'are', our epistemic thinking of what they 'mean' is also unformed. This thesis has attempted to answer two specific questions: *What is the effectiveness of academic and scientific poster presentations and how do academics perceive their importance in knowledge transfer?*, and whilst it presents a thorough initial investigation of the topic, it does not claim to have provided comprehensive and durable answers.

The epistemology of this thesis is drawn from a position of organic intellectualism, in that it seeks to 'catalyse and articulate the experience of [poster users], voice

their knowledge, echo their wisdom, and make them present in places where they are not heard or acknowledged' (Heredia, 2016, p. 19). It is argued that although there are piecemeal accounts of poster presentation in the literature, these are mainly relegated to opinion level, and their lack of research presence detracts from their surface credibility. In line with the title of Heredia's article (ibid.), the knowledge produced by this thesis serves to interrogate the academy, and to renegotiate the terms of discourse on the topic of conference posters. In looking to offer a pragmatic distinction between fact and opinion, Corvino (2014, p. 61) proposes that: '*A statement of fact is one that has objective content and is well-supported by the available evidence. A statement of opinion is one whose content is either subjective or else not well supported by the available evidence.*' This is particularly useful in this context, as rather than try to encompass all of the wide-ranging issues involved in such a distinction (e.g. belief and reality, subjective/objective distinction, descriptive/normative distinction), it refines the way in which fact and opinion are differentiated in everyday life. Given the trans-disciplinary and trans-professional scope of this research, such a distinction is viewed as being supportive in that whilst it may highlight individual viewpoints and opinions as lacking consistent and generalizable evidence, it does not reduce or belittle them because of this. Instead, the research featured in this thesis looks at what is said, why it is said, and presents it in order to improve our understanding of the present situation.

1.4 Coverage and appreciation of conferences

Despite their widespread and established existence, there is scant literary interest in academic conferences. Gross and Fleming (2011, p.153) note that no books had been published on the subject prior to 2011. Since then, books have started to appear which address conferences as an academic topic, and have begun to redress the observation of Breiter and Milman (2006) that most conference studies have been conducted from a meeting planners perspective, and that no specified user group studies have been conducted. Beyond the meetings industry literature, Segar (2015) examines the concepts of peer-connection at conferences to enhance learning and engagement; Pereira (2017) discusses conference practices in terms of feminist scholarship; Rowe (2017a) addresses the place and efficacy of conference poster presentation; Nicolson (2017) looks at conferences as neoliberal commodities; Edwards, Foley, & Malone (2017) show how conferences can have value as drivers of social change, in terms of the outcomes of chance encounters, networking and collaboration; and Høyer Leivestad and Nyqvist (2017) explore networking and other social processes at large-scale professional gatherings. [Author note: 2017 appears to have been a highly unusual year in terms of the number of conference-related works published.]

However, there is no specific coverage of ASP conferences as an educational focus in published literature series (i.e. academic journals). Illustrating this, a serial search of the Finnish Publication Forum (2018) for 'conference' oriented publications yields a total of 416 results (see Appendix 2). When implementing the Web of Science search domain of 'Education & Educational Research' and the Scopus domain of 'Education' as limiters, 197 series titles were returned, but none looked at conferences as an educational study area. A number of publications carry 'conference(s)' as a word in their title, however these are mainly publications and proceedings that result *from* conferences, and none address conferences as a specific topic. Furthermore, a wide range of journals are returned that are journals of a particular field (e.g. the 197 publications falling under *education* and *educational research*), but which have no relation to conferences as a study topic. As a result, a full range of ratings may be seen (Level 0-3), but these do not reflect what is available in reference to the specified search focus. As outlined in the Introduction to this thesis, conferences are mainly studied as events produced by the Meetings, Incentives, Conferences and Exhibitions (MICE) industry, and their study has been mainly restricted to a meetings industry perspective (Breiter & Milman, 2006). However, in the Finnish Publication Forum, none of the publication channels within the event management and tourism literature is ranked higher than Level 1, aside from the Annals of Tourism Research (3), Tourism Geographies (2) and Tourism Management (2). Thus, according to the grading of the Finnish Publication Forum, over 95% of the MICE literature is evaluated as being only of an ungraded or basic level.

As an international comparison, the Australian Business Deans Council (2018) publishes a master journal list, ranking journals as A* (top), A, B, C. When searching the 2,777 listed journals for 'conference' as a key word, only six journals are returned (3 at level B and 3 at level C). The Danish Ministry of Higher Education and Science (2018) ranks publications as ordinary channels at level 1, particularly distinguished channels at level 2 and excellent and most prestigious channels at level 3. When searching the 20,616 listed journals for 'conference' as a key word, a wide range of conference proceedings are listed. Similar to the Finnish Publication Forum (2018) high levels of returns are seen from the fields of engineering, computer science and information science, although conference series are featured across disciplines and topics. However, whilst there are various series rated at level 2 (nearly all from the fields of engineering, computer science and information science), the vast majority are ranked at the ordinary level 1. On an international scale, 155,704 conference proceedings are listed on the Web of Science database (KTH 2015), and 118,547 conference proceedings are listed in the Scopus (2018) database as bibliometric sources. Differences between disciplines exist in regard to the meaningful interpretation of citation rates and assigned impact factors of publications (e.g. Radicchi, Fortunato, & Castellano 2008; Vaughan, Tang, & Yang 2017), and both

the Web of Science and Scopus databases have been seen to introduce biases that favour Natural Sciences, Engineering, and Biomedical Research, to the detriment of Social Sciences and Arts and Humanities (Mongeon & Paul-Hus 2016). As such (and in-line with the recommendations of Mongeon & Paul-Hus, 2016), national and discipline-specific citation and publication indices are perhaps a more representative way of evaluating the appreciation of conference proceedings as a publication channel.

Conferences are clearly used as a medium of scholarly communication, however their function as a publication channel is debated. Conference presentations (e.g. oral and poster presentations, together with published papers) have been considered as 'outputs', yet from an early time they have been noted to be poorly reported (UNESCO, 1963). To examine the value attribution scholars give conferences as a publication channel, in 2017, the Finnish Publication Forum was seen to have removed 3,165 conferences from their database, and although they state that published conference outputs will be taken into account in the university funding model, they will be graded at the level of their publication channel (e.g. the series or book publisher, determined by ISSN/ISBN) (Finnish Publication Forum, 2017). Thus, the level of appreciation would seem to reflect the reputation of the publishing house, and not the esteem of either the conference event or the author's work. Of the conferences remaining on the forum, none are identified at Level 3 (top), only 6 (0.19%) are identified at Level 2 (leading), 935 (29%) are identified as Level 1 (basic), and 128 (4%) are acknowledged at Level 0. The remaining 2,102 event publications (66%) are ungraded. Thus, the Finnish Publication Forum grading system seems to extend a very low level of appreciation or recognition to conference outputs as scholarly publications, despite their widespread and established levels of production. Although the forum only addresses the publication channel, the number of academic outputs (conference papers and abstracts) for these types of events can vary from as low as 50, to as high as 10,000+, so the volume of potentially valuable academic knowledge on offer is considerable.

As there is no means of centrally evaluating this scholarly corpus, each output can only be judged on its individual merit. As these outputs are scattered among the multi-disciplinary literature and collation is clearly difficult (as demonstrated in the Finnish Publication Forum returns), then it is quite likely that the scholarly community is overlooking a vast knowledge resource, apart from those who have actually attended the event in question, or for whom conference outputs hold particular esteem. From a disciplinary perspective, this is reflected in the Finnish Publication Forum's acknowledgement that occasionally, the level of the *conference paper* will differ (presumably positively) from the determined level of the series or publisher. To this end, the domains of 'Computer and Information Sciences' and 'Electrical and Electronic Engineering / Information Engineering' have been singled out (Finnish Publication Forum, 2017) as particularly valuing conference papers as

scholarly outputs. Of the 634 conferences that remain on the Finnish Publication Forum system, 66 (10%) are ranked as leading (Level 2) and focus on computer science, information science and engineering. A further 39 conferences are ranked as 'basic' (Level 1) and 526 conferences receive a Level 0 attribution. All of these conference publications have similar subject foci, and as an observation, in Google Scholar's 2018 metrics, the IEEE Conference on Computer Vision and Pattern Recognition is the 20th ranked top publication, with an h5-index of 188 (median 302). It is not clear how the domain-specific attribution of computer science, information science and engineering conferences has been reached by the Finnish Publication Forum, or why other domains do not have similar attributions, but it is a general reflection of how conferences are attributed general value, and serves to illustrate the complexity and diversity that exists in appreciating conferences as scholarly publishing venues.

As a final observation, an interesting perspective of posters as a publication channel is the legal ruling reported by Adams and Pabst (2004), that posters have been deemed as a legally valid form of publication in the US in a US Supreme Court ruling under 35 U.S.C. § 102. This raises a differentiation between the legal definition of a publication, and the perceptions of what constitutes a valid publication within the ASP community.

1.5 The purpose of the research and research questions

This research sets out to establish the place and efficacy of poster presentations in the conference setting. Specifically, it looks to provide baseline evidence of how poster presentation is used on an international basis, interrogate their efficacy in promoting knowledge transfer, examine how poster presentation is perceived by those who use it (either to present or access information), to highlight areas of concern, and to direct future research and development.

The research poses the following overarching research question: What is the effectiveness of academic and scientific poster presentations and how do academics perceive their importance in knowledge transfer?

The answer to this question was sought through four sub-studies.

Sub-Study I looked to empirically determine the effectiveness of poster presentations on knowledge transfer, as represented by changes in participant knowledge, attitude or behaviour. The research question posed was: What is the effectiveness of poster presentations according to available published empirical studies on poster presentation? It also examined their effectiveness in comparison with other educational interventions, specifically in the context of health professionals and consumers.

Sub-Study II followed up on the results of Sub-Study I, and undertook a broader examination of poster presentation by way of an enhanced mapping review. It asked three specific research questions:

1. What are the main fields which use the poster medium?
2. To what extent is it used (in terms of numbers)?
3. How has it been developed since its inception and to what purpose?

Sub-Study III looked to obtain perspectives on how the poster medium is seen and valued by poster users. The overall research question posed was: How do poster users see and value the poster medium? Utilizing a survey methodology, it aimed to achieve a better understanding of the overall concept of poster presentations, within an academic and scientific context. It reported perspectives on conference delegate demographics, perceptions of posters compared to oral presentations and journal articles, the benefit of posters to their career, the efficacy of posters in presenting information, and the impact of poster presentations per- and post-conference. Options for poster presentation development were also explored.

Sub-Study IV recognised the limitations of Sub-Study III, and undertook a series of expert interviews to explore the needs and motivations of conference users, related to their conference attendance and poster presentation practices. It asked four specific research questions:

1. What are the principle delegate motivations to attend ASP conferences?
2. What do delegates need from their attendance?
3. What value and importance do they place on conferences and conference outputs?
4. How well do conferences meet the needs of delegates?

2. Literature Review

This section presents the main literary coverage of concepts and theories that relate to the effectiveness of academic and scientific poster presentations and their importance in knowledge transfer. This literature review section will explore the functional concepts of conferences and presentations, particularly the way that they are seen as an educational practice in the scholarly literature; their objectives of disseminating knowledge and networking; and the value attribution that can be seen in the ranking of conference-related publications.

2.1 Conferences seen as an educational practice or opportunity

As described in the Introduction to this thesis, ASP conferences have a clear link to education, particularly to higher education (by way of historical development, organization and delegate background), continuing education (based on the aims of information and knowledge access), and professional development (as seen in the nature of conference hosting and the general MICE industry literature). Hoyt and Whyte (2011) confirm the place of conferences as a continuing educational practice, yet there is no conference-centric stream of educational literature.

In the conference industry literature, 'education' is the most commonly stated objective for attendance (Table 2). No motivational studies had been noted before 1993 (Grant, 1994a). Conference groups have different needs (Grant & Weaver, 1996), and Høyer and Næss (2001) have asked whether higher professional and scientific understanding are the main motivation that has led to the growth in conference activity. However, most studies looking at conference motivations and behaviours have been conducted from the meeting planners perspective, and no specified user group studies have been conducted (Breiter & Milman, 2006). Mair (2010) found that conference attendees were influenced by issues such as conference location, networking opportunities, cost of attending, social aspects, conference and association activities, personal and professional development, intervening opportunities, travelability, and being directed by an employer to attend, but these were unable to be generalized to any specific group, due to the complexity, non-specific focus and mixture of results contained in the study. Lee and Min (2013a) identified functional/utilitarian, emotional/hedonic, social and epistemic dimensions in conference attendance, but a more recent study (Pearlman, 2016) has taken a longer view as to what conferences need to provide, emphasizing

that value, sustainability and return on investment are important goals to address. Most recently, Kordts-Freudinger, Al-Kabbani and Schaper (2017) have also found that education, networking, and personal/career enhancement are important goals to achieve at ASP conferences, and emphasized that interaction & return on investment are key elements that can lead to successful conferences.

From an organizers perspective, 'education and training' is also cited as being the most popular reason for them to host events (36%), followed by 'generating a profit' (30%) and 'networking' (30%) which changed places between 2016-2017 (Eventbrite, 2017).

Table 2. *Conference Attendance Motivations: 1993-2017 literature showing originating discipline and motivations for attendance*

Date & Origin	Study	Motivational ranking
1994 MICE [Meetings, incentives, conferences and exhibitions, or Meetings, Incentives, Conferences, and Events]	Grant, Y. N. (1994b). 'Factors that contribute to the selection process of meetings from the perspective of the attendee.' (Doctoral dissertation, Virginia Tech).	1. **education**, 2. leadership / professional activity, 3. networking, 4. reputation, 5. presentation
2001 MICE	Rittichainuwat, B. N., Beck, J. A., & Lalopa, J. (2001). 'Understanding motivations, inhibitors, and facilitators of association members in attending international conferences.' Journal of Convention & Exhibition Management, 3(3), 45-62.	1. **education**, 2. networking, 3. content, 4. career enhancement
2007 MICE	Severt, D., Wang, Y., Chen, P. J., & Breiter, D. (2007). 'Examining the motivation, perceived performance, and behavioral intentions of convention attendees: Evidence from a regional conference.' Tourism management, 28(2), 399-408.	1. **education**, 2. content, 3. networking, 4. travel, 5. career enhancement
2008 Management	Huang, Q., Davison, R. M., & Gu, J. (2008). 'Impact of personal and cultural factors on knowledge sharing in China.' Asia Pacific Journal of Management, 25(3), 451-471.	1. **share knowledge**, 2. networking, 3. personal/career enhancement
MICE	Yoo, J. J. E., & Chon, K. (2008). 'Factors affecting convention participation decision-making: Developing a measurement scale.' Journal of Travel Research, 47(1), 113-122.	1. **education**, 2. networking, 3. personal interaction
2009 MICE	Severt, K., Fjelstul, J., & Breiter, D. (2009). 'A comparison of motivators and inhibitors for association meeting attendance for three generational cohorts.' Journal of convention & event tourism, 10 (2), 105-119. DOI: 10.1080/15470140902949695	1. **education & holistic learning**, 2. professional socialization, 3. networking, 4. professional engagement

2011 MICE	Kim S., Lee J. S., & Kim M. (2011). 'How different are first-time attendees from repeat attendees in convention evaluation?', International Journal of Hospitality Management, 31(2), 544-553.	1. **education**/ networking, 2. networking/education
2013 MICE	Lee, J. S., & Min, C. K. (2013a). 'Examining the role of multidimensional value in convention attendee behavior.' Journal of Hospitality & Tourism Research, 37(3), 402-425.	functional/utilitarian, emotional/hedonic, social and epistemic dimensions
2012 Health Research	Neves, J., Lavis, J. N., & Ranson, M. K. (2012). 'A scoping review about conference objectives and evaluative practices: how do we get more out of them?' Health research policy and systems, 10(1), 26.	1. **education**, 2. networking, 3. career development, 4. professional engagement
2013 MICE	Lee, J. S., & Min, C. K. (2013b). 'Prioritizing convention quality attributes from the perspective of three-factor theory: The case of academic association convention.' International Journal of Hospitality Management, 35, 282-293.	Re-affirms that convention attendance is predicted primarily by an opportunity for **professional education**. Prioritizes quality attributes for the management of attendee satisfaction.
2017 Education	Kordts-Freudinger, R., Al-Kabbani, D., & Schaper, N. (2017). 'Learning and interaction at a conference.' New Horizons in Adult Education and Human Resource Development, 29(1), 29-38.	1. **education**, 2. networking, 3. personal/career enhancement: Emphasizes the importance of interaction & ROI

Conceptually, ASP conferences serve to gather members of a peer community in one place, for the purpose of exchanging information and perspectives on current topics in their field (Rowe 2017a, p. 9). de Vries and Pieters (2007, p. 237) see visiting conferences as an established way for practitioners and researchers to meet and share ideas, disseminate research, and to work together on ideas and projects. Their study found that most conference encounters were aimed at disseminating information, and although it was acknowledged that there were formal and informal opportunities for dialogue between inter-disciplinary delegates, it has not been generally examined whether these take place, or what their outcomes are. They further observe that the passive formats of conferences (for example attending oral presentations with little opportunity for audience questions or discussion, packed schedules and concurrent sessions, or mass poster session browsing) are not necessarily constructive towards fostering interaction, and this may be why conferences are seen more as knowledge dissemination venues, as opposed to a more developed forum of knowledge transfer and generation. In their conclusions, de Vries and Pieters (2007, p.246) share the

view of the Organisation for Economic Co-operation and Development (OECD) (2001) that:

> *'The role of conferences, presentations and other opportunities for face-to-face contact will not disappear, although virtual web-based meetings will add greatly to the possibilities for information exchange. There may, however, be changes in the way that these events are used, with contacts and initial 'browsing' of products on-line before the actual meetings take place. This will permit a greater focus on discussion and consideration of specific products during the meeting, and opportunity for professional cross-fertilization.' (p. 55)*

However, despite this viewpoint having been forwarded back in 2001, there seems to have been little advancement in this direction in mainstream ASP conferences.

2.2 Knowledge dissemination and transfer

The concept of conference education is expressed in terms of accessing and sharing information (see Table 2). In essence, this is achieved by attending and giving presentations, but the literature also highlights a sharing of knowledge (Huang, Davison, & Gu, 2008), which extends the passive exposure to presented information, towards its internalization as knowledge that can be used and applied. This ethos is also expressed in the above views of the OECD, where there is a clearly expressed importance on taking time to purposefully select items of interest before a particular meeting, so that time is used more productively during the actual event, and there are better opportunities to discuss matters with the gathered peer community. Conference literature provides information that helps to inform and influence scientists from outside their laboratory (Nielsen, 2013, p. 2076), and conferences are seen to offer access to front-line research, and are therefore an important aspect of scientific communication (p. 2081).

Henry (1974, p. 189) first identified information and knowledge as being '*data that change us*', and distinguished them from data that represent facts in their raw form. He further described a process of *knowledge management*, that proceeds from the production, dissemination and accessibility of information, to its potential for use or application in a given circumstance. This progression was later articulated as a hierarchy that represented progressive conceptualizations of data, information, and knowledge (e.g. Zeleny, 1987; Ackoff, 1989; Shedroff, 1999). In the conference setting, this can be seen in the practices of assembling data into presentations and papers, and presenting the information to the conference audience. However, in order to transform the information into a higher form of knowledge, it is necessary

to frame, contextualize, and internalize it (Davenport & Prusak, 1998), in order to give it meaning and credence (see Figure 1).

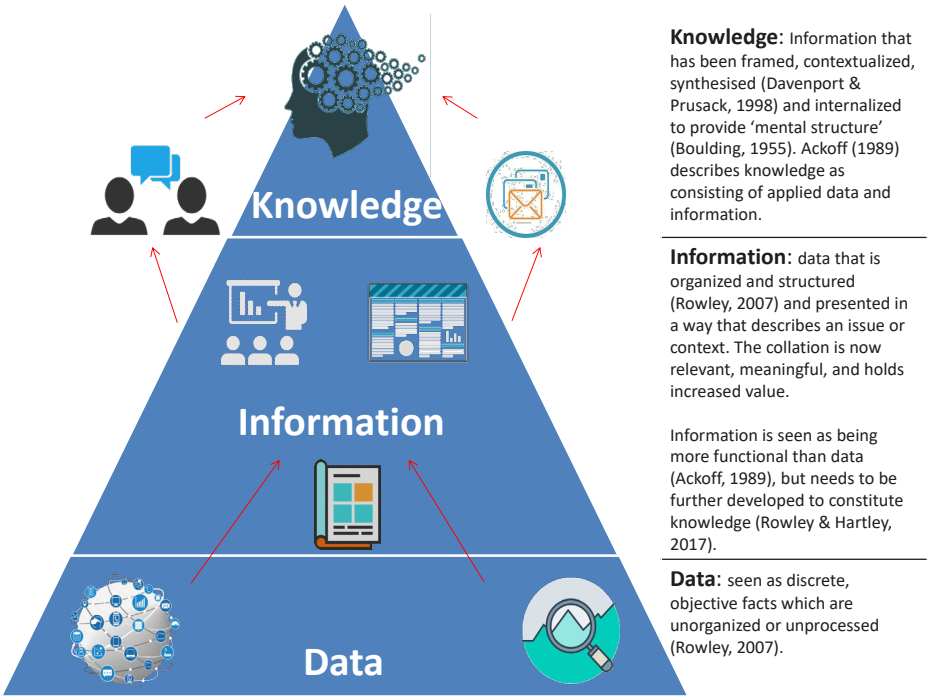


Figure 1. *The transformation of data into knowledge in the conference setting [adapted from the DIKW (data, information, knowledge, wisdom) hierarchy, attributed to Zeleny (1987)].*
Source: Author

Arellano et al. (2014) conclude that the aim of most conferences is to a greater or lesser extent to provide participants with knowledge they can use in daily practice. Andersen and Wahlgren (2015) note the lack of focus on the evaluations of conferences, especially in relation to their capacity for learning and transfer, which they see as being reflected in the relevance of conference content to the delegate, and the application or use of what has been learned in some tangible form. However, their study also found that delegates could still be satisfied with a conference without having thought they had learned something, or that they would use what they have learned in future practice (p. 42). So, although the conception of learning is prevalent in conferences, it is not necessarily a determinant of delegate satisfaction, and this would indicate that other motivations for conference attendance are present. Furthermore, this may also indicate that although there is a drive to present and access information, this may not extend to its inculcation as knowledge, which

therefore reduces the longevity and use-potential of the information conferences have to offer.

The willingness for knowledge acceptance, knowledge authority and its perceived importance shape the efficacy of knowledge transfer in scholarly communication (Wang, Ning, & Zheng, 2014). Also, in science and technology literature, knowledge distance has been seen to have a negative correlation with knowledge transfer (ibid, p. 63). Thus, if potential information users are separated from those who can help develop this information into knowledge, then although the presented information is seen as more functional that mere data (Rowley & Hartley, 2017), it is less likely to be given credence and appreciation, and has a lower potential for use. In the context of conferences, this knowledge distance can apply to researchers who are geographically separated, or to information that has not been accessed because a session has not been attended or a proceedings or contribution has not been read. Thus, in terms of distance, the turning of a page, the click of a mouse, or a journey of thousands of miles can have an equally significant impact on the practical utility of information.

Conferences are an established medium of continuing education, which Graham et al. (2006) define as 'a structured process of educating designed or intended to support the continuous development of [professionals] to maintain and enhance their professional competence' (p. 16). In a health professions context, they see continuing professional development as 'the process by which health professionals keep updated to meet the needs of patients, the health service, and their own professional development. It includes the continuous acquisition of new knowledge, skills, and attitudes to enable competent practice' (Peck et al. 2000, cited Graham et al. 2006). Although orientated towards the health professions (who feature heavily in CPD/E practices – see §1 of this thesis), these ideas of development, currency and accessing information can be seen as having similar value across academia, the sciences, and the professions. However, much of the commentary and discussion around conferences (e.g. de Vries & Pieters, 2007; Hoyt & Whyte, 2011; Arellano et al., 2014; Wang, Ning, & Zheng, 2014) speaks of knowledge dissemination, exchange and transfer, which extends beyond the mere presentation of information. The Canadian Health Services Research Foundation (cited Graham et al. 2006) view that '*Effective knowledge exchange involves interaction between decision makers and researchers and results in mutual learning through the process of planning, producing, disseminating, and applying existing or new research in decision-making*'. This is concretized in the term 'knowledge transfer' which implies a '*a systematic approach to capture, collect and share tacit knowledge in order for it to become explicit knowledge*' (Graham et al. 2006). Thus, if conference information is to be used effectively; not only must delegates have the possibility to access information, they must also have the opportunity to discuss and internalize it, in order for it to have greater potential as beneficial knowledge. This exchange and discussion takes knowledge that has been

produced in a single or restricted academic/disciplinary context (framed as Mode 1 knowledge production), and broadens it in terms of the context of application, transdisciplinarity, heterogeneity, reflexivity/social accountability, and novel quality control (framed as Mode 2 knowledge production: Hessels & van Lente, 2008).

In this thesis, *data* is seen as discrete, objective facts which are unorganized or unprocessed (Rowley, 2007). *Information* is seen as data that is organized and structured (Rowley, 2007) and presented in a way that describes an issue or context. The collation is relevant, meaningful, and holds increased value to data, but needs to be further developed to constitute knowledge (Rowley & Hartley, 2017). *Knowledge* is seen as information that has been framed, contextualized and synthesized (Davenport & Prusack, 1998), and has the potential to be applied to a particular setting or context (Ackoff, 1989).

It is also necessary to define the ways that conference information is managed. Graham et al. (2006, p. 16) view 'dissemination' as '*The spreading of knowledge or research, such as is done in scientific journals and at scientific conferences*'. In this thesis, the following definitions are proposed for the presentation and reception of information at conferences (author formulations):

Passive information dissemination:
Information that is potentially made *available* to delegates (e.g. conference proceedings and programs (hard copy or on-line), abstracts and papers published before or after the conference, poster displays (non-structured), virtual sessions (non-structured)), but which will only be accessed by those who actively investigate the information channel (e.g. read proceedings or repositories), or who encounter the information by chance (e.g. whilst browsing poster displays).

Active information dissemination:
Information that is actively presented to delegates, for example by direct feed announcements or information streams, or formal presentations to a gathered audience (e.g. oral presentations and structured poster presentations). This also extends to information (full papers and presentations) that is made reasonably available to an external audience via published conference proceedings (hardcopy or on-line), special issue series, web sites, web profiles, blogs, etc.

Knowledge transfer:
Information that is purposefully discussed between delegates and/or presenters. The discussions will culminate in an acknowledged comprehension of the presented information, together with a conception of how it relates to the receiving party's own context. The recipient will be the main beneficiary of the exchange, however the originator of the information will also gain perspectives of how their work may be perceived or applied in different settings.

2.3 Research on networking and communication in academic conferences

2.3.1. General findings

Exchanging views or information on a personal level (e.g. one-to-one or face-to-face) is a frequently expressed objective of conference attendance (see Table 2 in §2.1). Dolowittz and Marsh (1996) view that in isolation, people often think that their problems are unique, but that in reality, this is often unlikely. The coming together of like-minded communities to discuss topics helps to identify common issues, and can lead to new perspectives and solutions being found. Barnlund (1970) proposed a transactional model of communication to illustrate the simultaneous exchanges that are characteristic of conversational exchanges. Framed as reciprocal dialogue, these exchanges allow parties to progress from a discussion of the 'facts' presented, to a broader discussion of the contexts and issues involved (Rowe 2017a, p. 24). As well as allowing the subject matter to be better understood, these one-to-one exchanges allow delegates to gain a better appreciation of each other, and this engenders the networking principle that, according to the conference motivation literature shown in Table 2, is a principle aim of conference participation.

The networking process is often cited as an important way that conference delegates meet, access and share knowledge, and form collaborations to generate new knowledge creation (e.g. Grosseck & Holotescu, 2008; Reinhardt et al., 2009; Ebner et al., 2010; McKendrick, Cumming & Lee, 2012; Borgmann et al., 2015; Cheung et al., 2018). Networking can be seen in various contexts, from the prominent place of social networking in society (especially when supported by social media such as Facebook, Twitter, etc.), to business networking events (also supported by business media platforms such as LinkedIn), and also in professional networking meetings and conferences (supported through platforms like ResearchGate, Mendeley and Academia.edu).

All of these spheres of networking share common goals, and this is best seen through the aims and visions of their prominent social/professional media platforms. Facebook's stated mission is to '*Give people the power to build community and bring the world closer together*' and the platform has over 1 billion active members (Facebook, 2018). LinkedIn (2018) expresses a vision of '*creat[ing] economic opportunity for every member of the global workforce*' and a mission of '*connect[ing] the world's professionals to make them more productive and successful*'. ResearchGate (2018) was launched because '*collaborating with a friend or colleague on the other side of the world was no easy task*' – it now has over 15 million members. Mendeley (2018) '*facilitates collaboration across the globe and in every field of research*' and has 6 million members. These services get people together in a common area, allow them to access and share information, encourage communication, and support collaboration. In creating these contacts, people form links and establish common interests, so creating their

own 'network' of people who support their interests. The benefits of engaging in these types of activities may be social, business or career oriented. In the ASP context of using them as a forum to access and disseminate research, Academia.edu (2018) offers a good example, citing 64 million academic members, sharing over 21 million papers. The activity on the site gives evidence of engagement and communication between its members, and in terms of tangible reward, a study found that making papers available on the Academia.edu platform raised the citation rates by 16% after 1 year, 51% after 3 years, and 61% after 5 years (Niyazov et al., 2016). Thus, networking and sharing views and research can be seen to be a beneficial activity for academics.

The popular literature on networking is extensive. Searching the literature corpus, a Google Books Ngram (Figure 2) shows a massive upsurge in networking literature from the 1970s. An Amazon.com search for 'networking' textbooks related to communication and presentation yields over 589 returns, with lots of general interest titles such as 'Networking like a pro' (Misner & Hallard, 2017), 'The 20-Minute Networking Meeting - Executive Edition' (Ballinger & Perez, 2016), and 'Networking for Nerds' (Levine & Schmidt, 2015). Much of the literature is oriented towards business growth, sales, and career development, and the titles err towards images of a strong presentation of self or business and achieving success.

As well as popular literature, a number of web sources offer networking advice. Across a random sample of 'top tips' offered for networking, consistent advice advocates preparing well for the event, establishing contacts in advance, being approachable and attentive, using business cards and reminders, following up after the event, and engaging with social media.

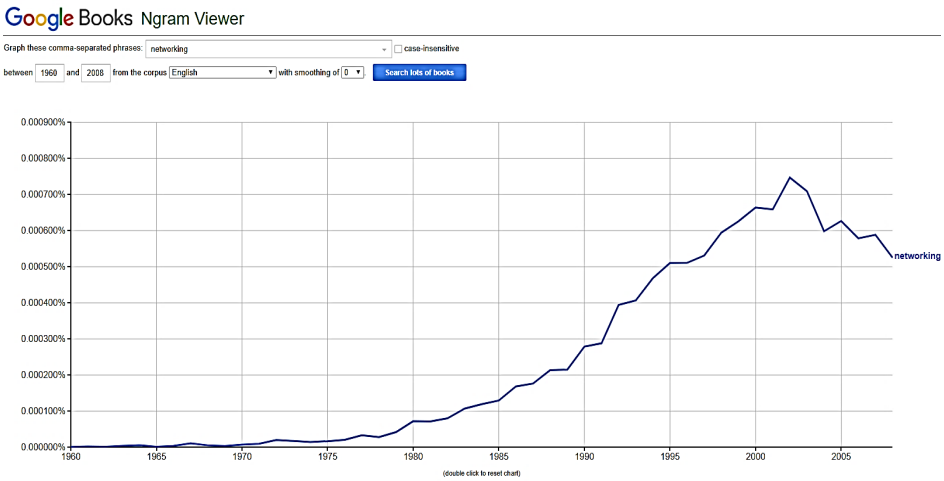


Figure 2. *Google Books Ngram of networking literature, 1960-2008.*

This latter aspect has been of interest in scholarly literature, especially in regard to the use of the Twitter microblogging service as a medium of educational and conference communication. Twitter has been proposed as a wider educational intervention, with applications for the classroom community, course/class blogs, reader response, inter-school collaboration, project management, metacognition analysis and expression, and also in conferences and workshops as a research resource, virtual classroom discussion platform, and creating a personal learning network in the edublogosphere (Grosseck & Holotescu, 2008). In the context of conferences, Kimmons and Veletsianos (2016) report that education scholars engage in Twitter use, and that professors and students have similar levels of usage in conferences, although professors were more inclined to engage with event-based hashtags (which tended to spike in the first week and were more short-lived), whereas students erred towards on-going hashtags.

Twitter has been reported as enhancing medical education in the conference setting (McKendrick, Cumming & Lee, 2012), and social networking innovations for use in conferences have also been patented (Shridhar, Sing & Brahmbhatt, 2010). However, it has been seen that only a few of these microblogs are of interest for non-participants beyond the specific event, and therefore the meaningful use of microblogging may be restricted (Ebner et al. 2010). That said, Aramo-Immonen, Jussila & Huhtamäki (2015) observe that discussions in social media networks can function as virtual collaborative co-learning environments, and that discussions prior to the event can increase the motivation to learn collaboratively.

Of note, there has been virtually no empirical research that examines the interactions of conference delegates with either each other, or with the content of the conference program they are attending. The lack of research into the physical interactions and exchanges that take place during conference events is somewhat surprising, given the major role that interaction and networking play in our conference activities. The technological enhancement of scientific communication during conferences is clearly of inter-disciplinary interest, as demonstrated by the breadth of Twitter-related literature (e.g. Grosseck & Holotescu, 2008; Reinhardt et al., 2009; Ebner et al., 2010; McKendrick, Cumming & Lee, 2012; Aramo-Immonen, Jussila & Huhtamäki, 2015; Borgmann et al., 2015; Cheung et al., 2018), but this strand of interaction is clearly supplementary to our physical interactions.

Face-to-face networking at ASP conferences has been little explored, and given the potentially vast number of events that are hosted every year (see Rowe, 2017a; Sub-Study II), this is a significant issue that affects a global, trans-disciplinary population. Why we have failed to explore this dissonance between what we profess to believe (i.e. the conceptual importance of conference interaction and networking) and the actualities of our engagement is not clear. The ideas of interaction and networking are integral to conference activities and learning. Interventions to augment the social space of academic conferences have been

undertaken, with an aim to enhance the participation of conference attendees (McCarthy et al., 2004). Computer mediated communication in the conference setting has been seen to enhance the social presence of attendees and hold positive implications for their interaction and collaborative learning (Gunawardena, 1995). Kordts-Freudinger, Al-Kabbani and Schaper (2017) have identified learning by interaction as one of the main research topics in educational sciences, yet feel that '*Although 30 years old, Boucouvalas' statement – "We must explore the issue of how to learn from conferences" (Boucouvalas, 1985, 55) – is still up-to-date*' (p. 30). As well as confirming the conference motivations of 'education' (expressed by 46% of their sample as a primary goal) and 'networking' (39%) as being primary expressed goals of conference attendance, they look at conference gatherings as communities of practice, and consider the way that social interactions work towards meeting the goals of conference attendees. Accordingly, they identified 'self-presentation (10%) as a third expressed goal, and their analysis identified that the goals of education and networking were both enhanced by interaction in the conference setting (p. 34).

2.3.2. Interactions with conference poster presentations

Interactions at conference posters have been theorized as cumulative reciprocal dialogue (Rowe, 2012, p.133), emphasizing a requirement for interaction. The poster serves to facilitate this interaction, acting as a common reference point for referral, aside from providing a set amount of standalone information. The interactions that take place during poster presentation between the author and the poster viewer serve to clarify the information presented, as well as allowing both parties to expand and digress on related aspects. This facilitates not only a better comprehension of the presented information, but also a degree of contextualization and internalization that develops poster presentation from being a static medium of information dissemination, to a plausible form of knowledge transfer and development. In terms of the needs of conference attendees, this results in the self-actualization process of developing knowledge and ideas (Olbrantz, 2012, cited Rowe, 2017a, p. 32).

More recently, the exchanges that take place at posters have been examined by way of audio analysis (Kawahara et al., 2016). Particularly, they note that unlike oral presentations, poster presentations are both interactive and multi-modal, allowing real-time feedback (verbal and para-verbal), confirmation, comprehension or refutation, as well as bodily communications such as standing and moving. Their IT augmented analysis confirmed the theorized concepts presented by Rowe (2012) of turn-taking (reciprocity) and interaction, as well as the poster acting as a facilitator of knowledge presentation and exchange (via eye gaze and interaction analysis). This process helps to demonstrate a process of poster viewers transforming the presented information into knowledge, by way of internal (and possibly peer) validation (Bhatt, 2001), with the aid of the poster as a shared reference medium. Furthermore, the concepts of how we look at posters in terms of presented displays of information,

and how we interact with headings, tables and figures, and textual elements offered by Rowe (2017b) have been confirmed by Wildgaard & Lund (2016), who used eye tracking technology to analyse the focal fixations of poster viewers. Especially, their study confirmed that the visual imagery of posters is the predominant area of focal interest for poster viewers, and that contrary to the views of poster presenters, poster viewers do not see posters as being able to function as a standalone medium of information dissemination.

2.3.3. Posters as a means of sharing knowledge in continuing and professional education

Conferences are an important element of our continuing and professional educational practices (MacIntosh-Murray, 2007; Rowe, 2017a). Continuing education is a broad umbrella term that reflects the need for workers to stay current in their fields. Going beyond a general ethos of currency and development, certain professions require their members to undertake formal development activities, and these may be seen as a part condition for professional registration. The UK Department for Education (2016a) views that '*The design of high-quality professional development is as complex a discipline as the design of high-quality teaching. It requires the planning of programmes of connected activities with clarity about intended outcomes, and evaluation*', and their implementation guidance (2016b, p. 5) specifically advocates attending education conferences '*to increase awareness of new ideas*'. ASP conferences offer the potential to access such information, and due to their implied professional nature, it can be assumed that quality events concur with the standard criteria that '*Professional development should be underpinned by robust evidence and expertise*' (Standard 2) and that '*Professional development should include collaboration and expert challenge*' (Standard 3). Furthermore, the Department of Education (2016b, p. 8) recommends that providers of professional development provide opportunities to '*draw out and constructively challenge participants' existing beliefs*', and to '*actively seek robust and independent evaluations of their programmes to demonstrate impact on intended outcomes*'. However, there is little evidence as to whether conference organisers have taken steps to address these measures, despite a range of 'credits' and 'certificates of attendance' being distributed to attendees. On a European level, teacher professional learning and professional development are differentiated, with professional learning seen as '*dynamic, ongoing, continuous, and set in teachers' daily lives*' (Caena, 2011, p. 10). Although the ethos of functional and applied learning may seem as a fairly logical professional attitude to continued professional development (CPD hereafter), this is not necessarily the case, and the benefits of conference attendance are often short lived – we have a 'good time', learn lots of 'interesting things' and have 'interesting conversations', but the outcomes of our activities are not clearly evident. CPD is also a mandatory requirement of many other professions, including medicine (e.g. GMC, 2012), nursing (e.g. RCN, 2016), allied health professions (e.g. HCPC,

2018), dentistry (e.g. GDC, 2013), and law (e.g. SRA, 2016). Looking beyond the UK, the CPD Standards Office (2018) recognises CPD as a global phenomenon and as a standard expectation of any professional body or regulator. Within Europe, Western countries have a larger number of professional bodies and institutions than their Eastern counterparts. Australia and New Zealand follow similar models to the UK. In America, CPD is also referred to in terms of Continuing Education (CE), Continuing Professional Education (CPE), Continuing Medical Education (CME) and Continuing Legal Education (CLE). However, the CPD Standards Office (2018) notes that more than 4000 professional bodies, regulators and institutes exist across the country, and that requirements differ on a state-to-state basis.

In addition to those who use conferences as a means for formal CPD, there are a wide range of professions that attend conferences to access and present the latest work in their fields, as well as to engage in professional socialisation and networking. In addition to 17 professional areas, Rowe (2017a, p. 13) notes 21 separate disciplinary areas, grouped under the domains of humanities, formal sciences, social sciences, computer sciences and natural sciences. All of these will have numerous sub-disciplines and working and interest areas, all of which will hold conferences that function as a means to pursue continuing learning and development. It is clear that members of these groups will both attend and present at conferences, and the core functions of knowledge sharing, development and professional networking remain the same for both regulated and unregulated activities. Again, higher education is a consistent reference point in conference literature, and many ASP conference delegates will be either employed or enrolled in higher education institutions, or follow professions that are grounded in higher education and training. Although conference events may not address education as a specific content theme, the concepts of disseminating and generating academic and scientific knowledge indicate that the mainstream study of ASP conferences would logically fall within a higher education purview.

However, the lack of dedicated literature and reporting suggests that there is no established field of study that examines conference practices, and that the continuing education departments of universities err towards the established domains of medical and educational CPD, albeit bespoke courses are sometimes arranged to meet the needs of particular groups.

At ASP conferences, the capacity for oral (or podium) presentation is understandably limited, even at the largest of events. As described in §1.1, poster presentation arose to address this situation. The aims and mechanism of poster presentation appear to have changed little since their inception. Since the early reports of poster presentation (also referred to as 'display sessions'), presenters would display their work in a visual manner, and delegates could browse the displays and engage in one-on-one discussions with the authors. In this way, poster sessions were seen as offering a more direct form of exposure for presenters, and facilitating

interactive peer exchanges that were not necessarily to be had with the more linear form of oral presentation format (see Rowe, 2014b for an interview with the chair of the earliest recorded 'demonstration session' in 1969). As a general concept this holds true. Posters display an overview of a defined subject, and the detailed knowledge is accessed by interaction with the presenter, and facilitated by referring to displayed points on the poster (see Rowe, 2012, p. 133; Rowe, 2017a, p. 12). Given their pervasive presence at ASP conferences, poster presentations are clearly a means of sharing knowledge in continuing and professional education, yet little research has been undertaken as to their mechanisms or practical efficacy. This is surprising as from a hierarchical ontological perspective (see §1.2), despite posters being a common form of conference presentation, they are ranked well below oral presentation and there are increasingly critical voices that serve to counter the generally positive positions adopted towards them in the literature.

2.4. Summary

This literary coverage of concepts and theories that relate to the effectiveness of academic and scientific poster presentations and their importance in knowledge transfer is extensive, however it is widely dispersed and has not been previously applied to this particular context. The place of conferences as a continuing educational practice features regularly in the inter-disciplinary literature, yet there is no conference-centric stream of educational literature. Resultantly, despite there being an evident expression of 'education' as being the primary function of such events (especially within the MICE literature), there is little-to-no exploration as to how this is achieved, and no measurement that shows that it actually takes place. Thus, the idea that we attend conferences and share our information effectively, with a result that we gain knowledge and forge professional connections with our peers is only conceptual.

The theories of how we develop data into information, and how this is inculcated as knowledge are also well established. In the conference setting, this can be seen in the way that we formulate research presentations (oral and poster), and deliver them to assembled or passing audiences. But, in order to develop this information into utilizable knowledge, there needs to be some form of meaningful exchange and interaction. As knowledge gain and development are key themes of the continuing education literature and practices (especially those relating to healthcare fields), then the lack of an examination of whether we simply encounter information, or whether we develop knowledge is surprising.

Networking is also a key expressed motivation to attend conferences, and in academia, science and the professions, there is considerable literature that underlines its importance. This has also manifested in various well supported media platforms

that connect individuals, and allow them to communicate and share ideas, regardless of their geographical separation. If ASP conferences exist to gather members of a peer community in one place, for the purpose of exchanging information and perspectives on current topics in their field, then their potential to create knowledge and networks seems obvious. Since the 1990s, conferences have grown exponentially in number, with masses of presentations being delivered. However, this area of scientific communication has not been explored to any depth. We have not looked at how (or if) we learn from conferences, and how information is effectively exchanged between delegates. Furthermore, we do not seem to have considered if the knowledge we bring to the conference table is effectively shared to an extent where it will achieve maximum benefit for as wide a range of people as possible. Poster presentation has emerged as a dominant medium of conference presentation, yet their purpose and mechanisms of action have received little research attention. Although there have been some attempts to increase the level of communication at conferences (especially with the use of social media), overall, our conference practices seem to have been subject to little research or development, and have changed little over recent decades. This is especially true of poster presentations, and their pervasive presence at ASP conferences is clear to see. Yet, despite them being a medium of sharing knowledge in continuing and professional education, little research has been undertaken into their mechanisms of information dissemination, knowledge generating potential, or their ability to facilitate networking at conferences.

3. Methodology

Scientific knowledge comes from gathering large amounts of data from a wide variety of sources. '*The unit of currency is not the single experiment, but the meta-analysis. Before scientists reach a consensus about something, there has usually been a meta-analysis, tying together the different pieces of evidence for or against a hypothesis*.' (Levitin, 2017, p. 183) Thus, in order to establish a case for development or investigation, a baseline must be established to highlight what is known, and also what is not known. In the field of poster presentation (and conferences in general) this baseline did not exist. Van Hulst and Yanow (2016) see the distinctive acts of selecting, naming, categorizing and storytelling (i.e. the elements of planning, conducting and reporting a scientific investigation) as key elements in the political framing of arguments as 'truth', but without baseline research, they can lack validity. Therefore, this thesis expands from a narrow inquiry to a broad-spectrum enquiry to establish the current status quo of conference poster presentation, to identify its formative issues, to investigate whether the process and practice of poster presentation is fit for purpose, and to offer plans for its development.

3.1 Methodological approaches used in this thesis

Researchers investigating the experiences, understandings and perceptions of individuals in order to uncover the reality of a situation often adopt an interpretivist paradigm and qualitative methods, rather than rely on statistical representations (Thanh & Thanh, 2015, p.24). So, given the lack of quantitative data concerning the use of conferences and posters, and the lack of research into the use and efficacy of posters in the conference setting, it seemed natural to adopt an interpretivist approach for this particular investigation.

Thanh and Thanh (2015) address the anti-foundational nature of interpretivism, noting that it values subjectivity, and rejects the imposition of fixed approaches to gaining knowledge. Furthermore, Smith (1993, p.5) states that '*Proponents of interpretivism do not accept the existence of universal standards for research, instead the standards guiding research are products of a particular group or culture*'. The conference culture among the ASP community is both established and diverse (see Sub-Study II), and as interpretive research, this thesis does not seek to examine the use of posters and perceptions of their effectiveness by the academic community in rigid ways, but rather to offer an encompassing explanation of what we do, as reflected in the reality

of those that do it. This is reflected in the survey and interview information seeking approaches that feature in Sub-Study III and Sub-Study IV respectively. In adopting an interpretive paradigm, this research seeks to gain an understanding of how the ASP community relates to poster presentation, how their practices are shaped by their social and professional spheres (McQueen, 2002 cited Thanh & Thanh, 2015), and ultimately, how effective their practices are at meeting their needs.

For this research, the wide scope of the conference field and the lack of literature or representative quantitative data pointed towards adopting a mixed methods approach that would help to provide information on the topic. Although constantly evolving, the concepts of mixed-methods research (MMR) are well established, and their history and importance are well-documented (see e.g. Creswell & Garrett, 2008; Morgan, 2007; Borrego et al., 2009). Morgan (2007, p. 49) describes MMR as a '*pragmatic approach*' that is used to support work that combines quantitative and qualitative *methods*, rather than directing focus to the metaphysical or philosophical concerns of the paradigm that is being followed. Importantly, Wisdom and Creswell (2013, p. 1) see mixed methods as combining:

> '[...] *quantitative and qualitative data within a single investigation or sustained program of inquiry. The basic premise of this methodology is that such integration permits a more complete and synergistic utilization of data than do separate quantitative and qualitative data collection and analysis*.'

What is important here is the synthesis of different forms of data to better inform an enquiry, and this process is evident throughout the presented research.

There is no established educational research field that examines conferences as centres of learning, especially in relation to higher education, continuing education and professional development. This is particularly surprising, given the large numbers of professions (particularly in healthcare and education) that grant 'continuing education credit' for attending conference events. This credit is used for demonstrating professional currency for registration/re-registration purposes (see e.g. Peck, McCall, McLaren & Rotem, 2000 for an international comparison in healthcare, and individual event examples such as conferences in psychiatry [ADAA 2018], law [RSA 2016], public health [APHA 2017] and education [Camden Conference 2018]). Conference organisers offer 'credited education' for a wide range of professionals (e.g. The Conference Board hosted 123 in-person events in 2016). Yet, other than certificates of credit/attendance, there is little evidence to show the educational efficacy of these activities. A number of journals exist on the topic of continuing education, but despite the significant role they play in exposing people to new work in their fields, conferences have received very little attention outside of the events industry literature (Sub-Study IV; Rowe, 2017b). Conference outputs in general have been noted to be poorly reported (e.g. UNESCO, 1963),

and the mapping review of poster presentations (Sub-Study II) clearly highlighted their 'grey literature' nature (pp. 114-115). Because of this lack of centralised data, *triangulation* was used as a method by which to increase the depth and validity of the research. Heale and Forbes (2013) describe triangulation as '*the use of more than one approach to researching a question*', and this again reflects the anti-foundational and pluralist nature of interpretivism (Thanh & Thanh, 2015).

With such a widespread but poorly reported poster usership, it was not possible to attempt a definitive investigation of the effectiveness and perception of poster presentation. So, triangulation was used to gather diverse forms of information, and to construct perspectives that could be seen as representative of a general population of poster users. This took the form of: *data triangulation* (as reflected in the returns of the open search process and the use of both formal databases and search engines to derive data (Sub-Study II); and *between-method triangulation* (as described by Flick, Kardoff & Steinke, 2004, p. 180) that employed different review types (Sub-Study I / Sub-Study II), and the use of survey (Sub-Study III) and interview (Sub-Study IV) methods. *Theory and philosophical triangulation* are also used to explain the data from multiple perspectives (see §3.3), and *environmental triangulation* is also evident to some extent, as the comprehensive literature review (Sub-Study II) and the randomly selected interviewee panel (Sub-Study IV) sought to find international perspectives.

MMR has been seen as a 'third movement' (Tashakkori & Teddlie, 2003) that places the utilitarian concerns of gathering whatever information may be useful on a topic, before the methodological and paradigmatic concerns of a particular discipline. In Sub-Study II, such an approach was adopted in order to shed light on an area that has remained neglected for over fifty years (see literature review for details). In collecting and reporting the findings, quantitative data was enhanced with qualitative observations and a multi-perspective approach, so as to give a realistic perspective of how poster presentations (and conference outputs in general) are used on a global scale (see the notes on saturation and representivity in §5.). Figure 3 shows the mixed method applications that have been used in this research.

How mixed-methods approaches have been applied in this research

Already in other studies, there had been an acknowledgement of the lack of research surrounding poster presentation (e.g. Rowe & Ilic, 2009), and its sparse distribution among the scholarly literature (MacIntosh-Murray, 2007). Conference presentation is a multi-disciplinary activity that takes place on local, regional, national and international levels, and there is no evidence that these levels have any relation to the quality of work produced. Therefore, you may find novel research of a high quality being presented at various different types of conferences. Even since 1979, oral presentation has been given superficially higher levels of appreciation than poster presentation (Eisenschitz et al, 1979). However, conference organisers tend

to designate submissions based on the abstracts they receive, and this is complicated as Rothstein (1990) acknowledged that abstracts alone cannot convey sufficient information for a reliable quality assessment to be carried out, and Dossett et al. (2012) have found no meaningful differences between the abstract quality of accepted oral and poster presentations. As the potential area that might inform the research question is extensive and ill defined, to capture and converge both quantitative and qualitative data, a mixed method approach was indicated (Teddlie & Fen, 2007; Borrego et al. 2009).

As a further complication, the novelty of this research precluded any prediction of the findings, so the enquiry was seen as being potentially open ended until sufficient evidence was obtained. In the sub-studies presented in this thesis, the research strands employ different sampling approaches, based on the findings that emerge. It is acknowledged that sequential mixed methods research relies on expert judgement to determine the sampling approach which is needed (Teddlie & Yu 2007, p. 87). It is also acknowledged that it is not possible for any mixed method research typology to be all inclusive, as the diversity of potential research directions will often lead to new approaches being formed (Leech & Onwuegbuzie, 2009). Therefore the individual approaches adopted in the presented articles are described by their closest typology descriptors, as recognised in the MMR literature. Given the sequential, but non-linear way that these investigations evolve to answer the overarching research question of this thesis, it is necessary to provide an indication of the findings, in order to justify and explain the progression to the next methodological approach. This underlines the data-driven nature of this research.

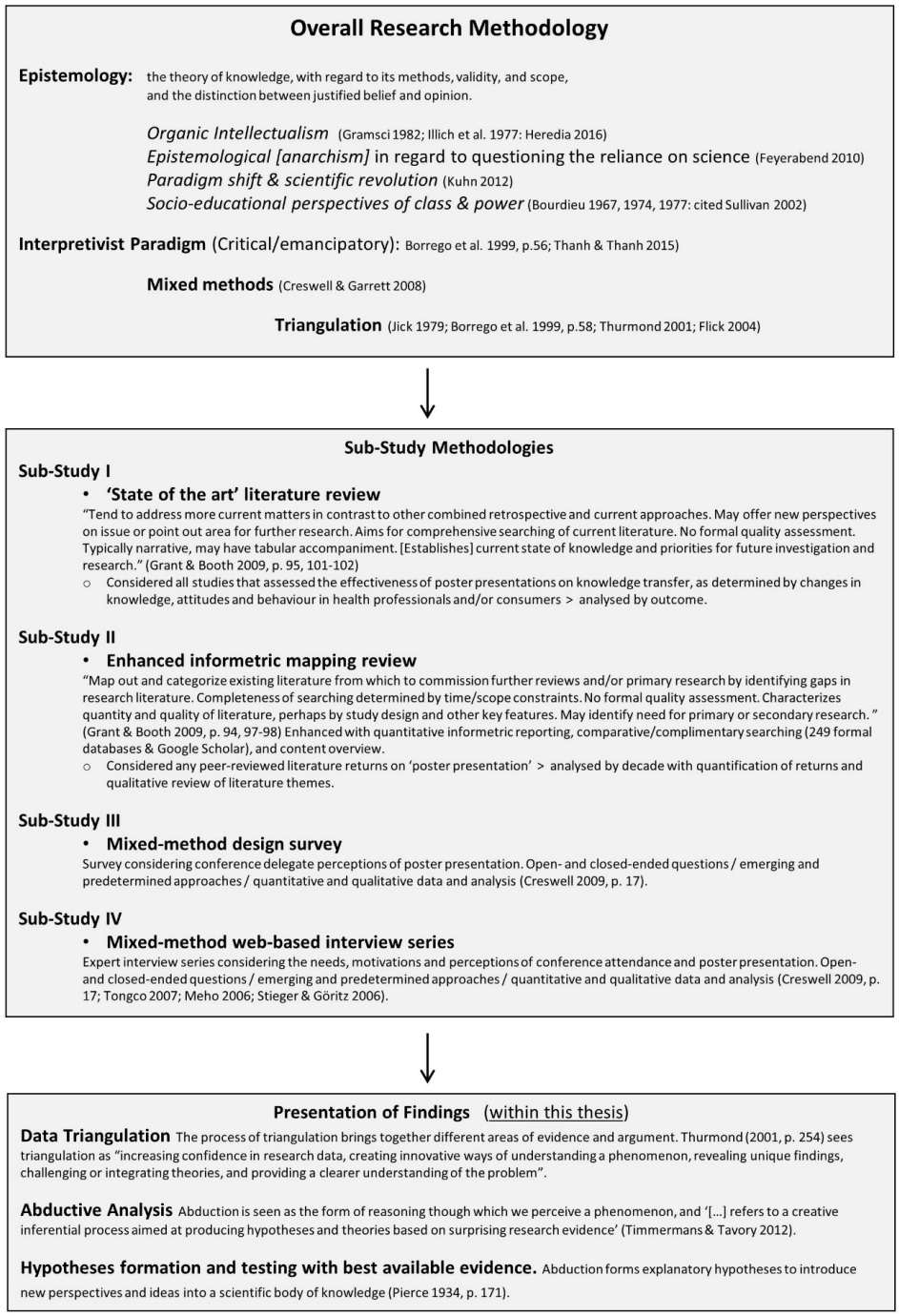


Figure 3. *Epistemology, methodological approaches and analysis.*

Source: Author

Sub-Study I carried out a state of the art literature review to determine the effectiveness of poster presentations on knowledge transfer. Peer-reviewed studies were included, regardless of whether they were quantitative or qualitative in nature.

Sub-Study II employed an enhanced informetric mapping review (Grant & Booth, 2009, pp. 94, 97-98) that presented quantitative data on poster presentation literature, as well as including qualitative perspectives that lay outside the bounds of research-based studies.

Sub-Study III employed a mixed-method design survey using open- and closed-ended questions, emerging and predetermined approaches to thematic formation, and quantitative and qualitative data collection and analysis (Creswell, 2009, p. 17).

Sub-Study IV conducted a mixed-method web-based interview series, with open- and closed-ended questions, emerging and predetermined approaches to thematic formation, and quantitative and qualitative data and analysis (Creswell, 2009, p. 17; Tongco, 2007; Meho, 2006; Stieger & Göritz, 2006).

According to the typology of mixed method research designs, each of the sub-studies may be classified as *Fully Mixed Concurrent Equal Status (F2)* studies (Leech & Onwuegbuzie, 2009, p. 269), where they feature a fully mixed quantitative and qualitative analysis, conducted at the same time, and where quantitative and qualitative data are given equal consideration. However, when viewed retrospectively, the overall examination presented in this thesis may be seen as a *Fully Mixed Sequential Equal Status (F3)* study (Leech & Onwuegbuzie, 2009, p. 269) that offers no dominance of either quantitative or qualitative data.

When discussing the interpretivist paradigm, Willis (2007) notes a core belief that the reality of any situation is socially constructed by those involved. In the context of poster presentation, poster presenters presumably act with specific objectives in mind, and the benefit they draw from their actions reflects their value attribution towards their activities. In the process of attending and presenting at conferences, they will also become poster viewers when exposed to the work of others. Thus, poster presentation does not occur in isolation, and there are likely to be influential factors (if not biases) which stem from the wider conference experience.

In Sub-Study III, the conference delegates of a large international meeting were surveyed. The respondents featured PhD students and post-Doctoral researchers/ scientists. In the interview series reported in Sub-Study IV, respondents were selected from a variety of disciplines in order to elicit their views and experiences of poster presentation and conferences in general. The interviewees stemmed from 14 different countries and all were qualified to doctoral level. Their familiarity and engagement with conferences and posters was pre-determined so that they could be deemed as 'expert' in recounting their experiences and views. Expert interviews are seen as yielding the expert knowledge that is required in processes of modernisation (Meuser & Nagel, 2009, p.17), and this corresponds not only with my earlier work which looked to modernise posters by incorporating IT technologies (e.g. Rowe

& Ilic, 2009a; 2009b) , but also with the wider literature indicating that poster presentation practices had not kept pace with the needs of modern conference users.

3.2. Data collection and analyses

The methodological approaches employed in the articles within this thesis are presented in Figure 3. This section describes the approaches used for data collection and analysis in each sub-study, and how the findings of each sub-study influenced the methodological choices featured in the subsequent articles presented in this thesis.

3.2.1. Data collection approaches

Sub-Study I

Sub-Study I offered a 'state of the art' literature review (Grant & Booth, 2009, pp. 95, 101-102) aiming for a comprehensive search of the literature. A state of the art literature review is here understood as a means to illustrate the current situation of an issue, and highlight perspectives for examination and future research. Given the contemporary prevalence of poster presentation at healthcare conferences, it was envisaged that there would be some depth of literature that supported their efficacy in promoting knowledge transfer. However, the dissatisfaction expressed in the literature, as well as the direct personal observations of the authors did not support this assumption, so the state of the art literature review was carried out.

The Medline, Allied and Complementary Medicine, PsycINFO, ERIC and Cochrane Database of Systematic Reviews were searched for studies published between 1946 and 2012. These databases offer some of the most comprehensive information corpuses in medicine and healthcare and are frequently used by practitioners and researchers in these fields (e.g. De Leo et al, 2006; University of Cambridge, 2018; Harvard Library, 2018). The search terms included 16 descriptors of medical, nursing and dental continuing and health education, at diploma, undergraduate and graduate level. Multi-purpose (mp) key word levels interrogated medical, health, biomedical education and health promotion fields. Posters were examined with key words of 'poster', 'posters' (as topic), and 'poster presentation'. Knowledge transfer was examined with knowledge/health knowledge, attitudes, practice/information dissemination and knowledge transfer. A full range of combination/alternative groups were applied.

The inclusion criteria considered any studies that assessed the effectiveness of poster presentations on knowledge transfer, reflected by changes in knowledge, attitudes and behaviour in health professionals and/or consumers. There was no formal quality assessment process, and the inclusion/exclusion rationale for each of

the 51 retrieved articles is described in full in the published paper (see Sub-Study I: Table 2). Examples of exclusion are: Hertrampf et al., (2011) – the intervention did not involve poster presentation; Price (2010) – the article was a subjective commentary; Vessey and DeMarco (2008) – the focus of the paper was not on posters and knowledge transfer. Examples of included studies are: Jung, Senthilselvan and Salopek (2010) as the study considered how posters can be effective in the practice setting; Etter and Laszlo (2005) who examined whether posters used in a purposeful campaign were effective in disseminating knowledge and changing behaviour; Rowe and Ilic (2009a) – who surveyed academics regarding their opinions, experiences and attitudes and experiences of poster presentations in the conference setting; Lieger et al., (2009) who examined the impact of educational posters on the lay knowledge of school teachers.

Studies were analysed by outcome (i.e. the reported effects poster presentations had on knowledge transfer, as determined by changes in knowledge, attitudes and behaviour). In total, 15 studies met the inclusion criteria (see above), and both authors independently identified aspects that related to poster effectiveness. Of these, 14 related to standalone or informational posters used in practice, and one to poster use in conferences. In-line with the review methodology, the results were presented as a synthesised perspective on the status quo, and to establish priorities for future investigation and research (Grant & Booth, 2009).

Methodological progression

With the exception of a single small-scale study (Rowe & Ilic, 2009a), there had been no research into the user perceptions of academic-scientific posters, or whether their poster activities met their professional needs. No further quantitative data was available to inform the value and efficacy of poster presentation, and Sub-Study I revealed no research-based evidence to support posters as an effective means to disseminate or transfer knowledge in the conference setting. Furthermore, it was noted that standalone posters were less effective in knowledge transfer, and that supplemental material was required to achieve noticeable changes in user knowledge, attitude and behaviour (Sub-Study I, p. 10). These findings ran contrary to the general literature that advocated conferences as an arena in which to share and access new research, and specifically that academic/scientific posters should be able to act in a standalone capacity (see e.g. MacIntosh-Murray, 2007; Rowe & Ilic, 2009a). This raised a concern that despite knowledge transfer not being predictably achieved, people still continued to present posters in high numbers. Thus, there must be alternative motivations for undertaking poster presentation, and consequently, a mixed-methods interpretivist approach to data collection was developed that sought to uncover the experiences of conference participants in regard to poster presentations, and to construct an understanding of the given context.

Sub-Study II

Sub-Study II presents an enhanced informetric mapping review. A standard mapping review (Grant & Booth, 2009, pp. 94, 97-98) looks to '*map out and categorize existing literature from which to commission further reviews and/or primary research by identifying gaps in research literature. Completeness of searching determined by time/scope constraints*'. This methodology was enhanced (author's own development) in order to manage the mass of data retrieved from the open search approach, and also to aid the presentation of the findings in quantitative and qualitative terms. No similar literature review approach existed in mainstream practice at the time of writing (see Grant & Booth, 2009; Hart, 2018).

Because of the puzzling results offered in Sub-Study I, the review was enhanced with quantitative informetric reporting, comparative/complimentary searching, and a content overview. In order to capture as full a picture as possible, a purposefully open search term of 'poster presentation' was employed, and reflected the approach used in two earlier investigations on the topic (Brownlie, 2007; MacIntosh-Murray, 2007).

A total of 249 databases were interrogated (full list published on-line). In-line with the review methodology, there was no formal quality assessment, other than the returns being peer-reviewed material. The formal databases yielded over 119,000 returns, all of which were reviewed for relevance, return type and content. In addition, a comparative search was made using the Google Scholar search facility, which yielded over 370,000 returns (0.95% / 3,515 items reviewed). The data was quantitatively mapped by decade, and enhanced with disciplinary analysis (top 5 returning disciplines plus healthcare field contributions) and a Google Scholar comparison. No attempt was made to focus on a specific discipline, and returns were treated equally in value. The returns were reviewed using an informetrics approach, which is the study of the quantitative aspects of information (Wolfram 2003). This includes how information is produced and by whom, how it is disseminated, and makes no restrictions on its type or origin.

As an academic critique on the 'grey literature' of poster presentations, the key returned literature was described in terms of content, although no formal content analysis (e.g. the quantification or analysis of specific words or concepts) was attempted. Results were presented by decade, with a quantification of database and search engine total returns. Additional quantitative analysis illustrated the top 5 contributory disciplines, healthcare contributions and retrieved articles for each period. Comparative trends were presented for the returns of literature by decade for database and Google Scholar search engine (see Sub-Study II: Figure 1), and also the discipline contributions over a 30 year period (see Sub-Study II: Figure 2). A qualitative review of the retrieved literature was presented for each period, highlighting the main themes and findings which were presented. The results offered the first comprehensive view of poster presentation, as represented in the global literature.

Methodological progression
The study (Sub-Study II, p. 114) noted that:

> *'[W]hen addressing such a large body of information over such a broad time frame, a qualitative summary was required to contextualise issues across the data and highlight areas for further research. So, from a methodological perspective, this mapping review also shares some of the characteristics of mixed methods and scoping reviews. Adopting this type of approach may therefore prove useful to researchers examining similarly broad fields.'*

The work also highlighted some methodological problems that may occur when using 'refined' approaches to information retrieval, such as title-only, key word and peer-review material searches. These were evidenced using a replicated search from library and information science perspectives, and showed how more advanced search approaches may exclude potentially useful information. As such, it was recommended that '*when searching for information, open search approaches should at least be examined to verify if an advanced database search represents a true picture of the sources potentially available*' (Sub-Study II, p. 117).

Poster presentation was indicated to be the prevalent medium of presentation in the conference setting, and more generally as a prevalent medium of trans-disciplinary scientific communication (Sub-Study II, p. 116). However, the poster discourse revealed mixed opinion as to its efficacy to disseminate knowledge and facilitate networking. In its conclusions, the work emphasized a need to differentiate between the personal and objective needs of poster users (e.g. poster presenters, viewers, conference organisers, funders, researchers and information specialists) and to ensure that systems and practices are geared towards meeting them (Sub-Study II, p. 121). As a result, a survey of poster users was conducted to identify these needs, and the results are reported in Sub-Study III.

Sub-Study III
In Sub-Study III, the perceptions of poster viewers and presenters were explored using a mixed-method survey design, with open- and closed-ended questions, and quantitative and qualitative data and analysis (Creswell 2009, p. 17). Data was collected by way of a paper survey (see Appendix 4), distributed in the delegate packs of the FEBS/EMBO 2014 conference held in Paris from 30 August to 4 September 2014. The research was approved by the research ethics committee of the University of Lapland (dnro 187/00.05/2014). It is acknowledged that this research was opportunistic (I had been invited to present a poster at the conference (Rowe, 2014a) and write an article on 'poster presentation' (Rowe, 2014b) in conjunction with the discovery of the FEBS organization as being the earliest to introduce poster sessions at an international meeting in 1969). As a result, there was no time to

pilot the survey instrument (Kelly et al., 2003). The survey contained 9 questions exploring respondents' demographics and presentation / publication experience; 10 questions exploring their perceptions of conference presentations, and their wider efficacy and value; and 10 questions concerning their views on the function and value of poster presentations (see Figure 4 for examples of questions). Respondents were also able to add their own perspectives in a final open-ended question on poster development.

The questionnaire (see Appendix 4) included fully detailed participant information, including a description of the purpose of the research, the implications and voluntary nature of participation, the planned dissemination of the research, and an assurance of the confidentiality of supplied data (Kelly, 2003; Parahoo, 2014). The information was formatted so that it was easy to read (Franck & Winter, 2004), and contained the researchers contact details, as well as the details of the research ethics committee of the University of Lapland in case of complaint.

All of the survey questions were constructed as simply as possible, using familiar terms and language that an international conference delegation would find easy to understand and respond to (Saunders, Lewis & Thornhill, 2003), and were targeted at capturing the perceptions of poster presenters and viewers. The questions addressed single issues, and were grouped by subject (Kelly, 2003). To ensure the sensitivity of the questionnaire, perceptions of importance were constructed using a five-point Likert scale, and questions of agreement were constructed using a seven-point Likert scale (Wong, Ong & Kuek 2012). To further enhance the instrument's '*ability to accurately measure variability in stimuli or responses*' (Zikmund, 2003, p. 304), respondents were given the opportunity to raise any other comments they had on poster presentation at the end of the survey.

Although 2000 surveys were distributed, only 37 were returned. This is partly seen as resulting from the possible issues of survey fatigue and the manual input requirement of paper surveys. Ben-Nun (2008, p. 742) notes that: '*Participating in a survey requires time and effort; respondents often need to reflect on their behaviours, retrieve or construct opinions on issues* [...]', and this was a central requirement of the survey instrument. Additionally, Fan and Yan (2010) note that topics of high salience tend to attract higher response rates. Thus, the clear disassociation between the survey topic (poster perception) and the conference theme (bio-chemistry) has likely been influential in the low response rate.

When respondents were asked to e.g. quantify the number of conferences they had attended, posters they had presented, etc., data was reported by way of average scoring. Importance or value attributions were established with Likert scale ratings (see Gracyalny, 2017 for description) and reported as percentages, mean average value scores, or descriptive statistics.

Methodological progression

In the results, the responses were consistently positive when expressing the importance of conferences and poster presentation, but opinions became more varied when delegates were questioned about how well they thought posters functioned. This was congruent with the opinions expressed in literature (see Sub-Study II) and so standard deviations were calculated to demonstrate this difference (not published in Sub-Study III). Standard deviation is a measure of variability taken to show the dispersal of data values from the mean of the population (Altman & Bland, 2005). As shown in Figure 4, the standard deviations tend to be $<\approx 1$ (more congruent to the mean) for questions relating to their own valuations, but $>\approx 1$ for questions relating to how their work may be appreciated or seen by others. This difference suggested that the needs and motivations for conference attendance and poster presentation may be more complex than previously thought, and supported a more detailed study being undertaken.

Figure 4. *Standard deviations in the survey: Poster Perception - Presenters & Viewers.*
A) When expressing importance, survey respondents were consistently positive in their judgements, with the average standard deviation among questions 6a–8b being 0.88. B) When expressing opinions as to the function and efficacy of posters (questions 9a–11g), respondents were less positive (see PhD 3), and the average standard deviation between their answers rose to 1.41 (+62.4%).

Source: Author

Sub-Study IV

In Sub-Study IV, a series of 16 in-depth interviews was undertaken with experienced conference attendees. The interviews were conducted via the Research Gate message platform or by reciprocal email messages (see e.g. Meho, 2006; Stieger & Göritz, 2006 for full methodological discussions). The interview sample was purposefully

selected (Tongco, 2007) in that potential interviewees were randomly selected, who's Research Gate profile indicated they were qualified to doctoral level, and were therefore likely to have experience of conferences and poster presentations. This experience was directly confirmed, prior to interview commencement. As this study formed a baseline investigation, the randomness of nationalities and disciplinary/cultural influences was seen as a desirable element, and any investigations of specific influences and contexts would provide areas for future research. However, respondents stemmed from the UK, Germany, Sweden, Italy, Spain, Estonia, Croatia, Hungary, Turkey, India, Nigeria, Trinidad and Tobago, and the USA, giving a geographically wide range of perspectives.

The interview approach was mixed-method, and as this has been seen as especially suitable for examining communities of practice (Denscombe, 2008; Eckert, 2006; Wenger, 2009), the approach is suitable for the study of academic conference communities. The semi-structured interview (see Appendix 5 for the interview guide) contained 32 quantitative questions where items could be selected, importance could be scaled, or levels of agreement could be indicated (Likert type responses). Responses were also qualitatively explored using 36 open ended questions. As with an oral interview, individual points were discussed through reciprocal message exchange.

In the preparation phase, interview responses were anonymised and collated according to question. The quantitative data was tabulated, mean scored and reported in mean average terms ($\bar{x}$), as used in the preceding study (Sub-Study III) and a corresponding motivations study by Mair (2010). In so doing, a direct comparison between the three studies was made, and used to contextualise the results. The qualitative responses were analysed using inductive content analysis. This is seen as being especially suited to this type of examination, given its potential to '*derive meanings, intentions, consequences and context*' (Elo & Kyngäs, 2008). The responses were analysed for key elements, categorised into recurrent themes, and abstracted with reference to the findings of previous research (Elo & Kyngäs, 2008). The qualitative open response questions gave interviewees an opportunity to explain their position and to express their own experiences and perspectives, and these were featured throughout the paper.

3.2.2. Abductive thesis analysis

This thesis derives its observations and conclusions by a process of abduction analysis. Abduction is seen as the form of reasoning through which we perceive a phenomenon, and '[...] *refers to a creative inferential process aimed at producing hypotheses and theories based on surprising research evidence*' (Timmermans & Tavory, 2012). The process of abductive reasoning differs from those of deductive and inductive reasoning as shown in Figure 5.

Theories are often considered as end-products that comprise '[...] *a set of concepts related to each other through logical patterns of connectivity*' (Birks & Mills 2015, p.

113). However, Murphy and Medin (1985, p. 290) suggest that theories can take the form of any of a '*host of mental "explanations", rather than a complete, organized, scientific account*'. Based on these two contextualised concepts of theory generation, it is argued here that in areas of novel research that lack baseline studies, the logic of abductive reasoning (as described above) may also be inverted to test popular assumptions by way of triangulating existing theory and evidence from other areas. In this research, this approach has been taken to show e.g. the way that reading rates can be used to challenge assumptions that posters may be purposefully selected and visited (Sub-Study II, p. 115), or that mass poster displays offer delegates a manageable way of viewing/accessing poster information (Sub-Study III, p. 3661, 3666–3667; see Rowe, 2017a for full discussions).

As an early proponent of abduction, Pierce (1934, p. 171) saw it as the 'process of forming an explanatory hypothesis', and 'the only logical mechanism that introduces new ideas into a scientific body of knowledge'. In abductive analysis, a researcher posits to lead away from old perspectives and create new theoretical insights, and the abduction process refers to an inferential creative process of developing new hypotheses and theories based on surprising research data and evidence (Timmerman & Tavory, 2012). Importantly, abductive analysis emphasizes that researchers should enter the field with a view to revisit, defamiliarise, and to 're-case' or re-shape the themes that arise from the data in ways that offer new insights or explanations (Timmerman & Tavory, 2012), and this is demonstrated by the challenges and new perspectives that have been raised in this research, and which are presented in the Discussion and Conclusions of this thesis. The concept of inverted abductive reasoning has been proposed to reflect the findings of this thesis, in that whilst both the general literature and the continuing education sector reflect conference activities as being educationally motivated and educationally beneficial, there are few tangible markers of conference outputs being appreciated as an 'academic currency', so their educational efficacy is, in fact, questionable.

Deductive Reasoning: All A are B > C is A > ∴ C is B

Inductive Reasoning: All observed A are C > ∴ all A are C

Abductive Reasoning: Surprising fact C is observed

> If **A** were true, then **C** would be a matter of course

> ∴ there is reason to suspect A is true

(Pierce 1935 cited Timmerman & Tavory, 2012)

***Inverted Abductive Reasoning*:** A population believes that **A** is true

> **If A were true**, then B, C etc. would be seen as a matter of course

> If B, C etc. **are not seen**, then A is likely to be untrue

(Author's own formulation)

Figure 5. *Abductive reasoning (Pierce 1935) and Inverted abductive reasoning (Author's own formulation).*

3.3. Summary of methodological choices

In relation to determining the effectiveness of academic and scientific poster presentations and the way academics perceive their importance in knowledge transfer (the overarching research focus of this thesis), the methodological choices employed have proved relatively successful. In line with Thanh & Thanh (2015, p. 24), adopting an interpretivist paradigm and qualitative methods has allowed the investigation of the experiences, understandings and perceptions of individuals related to poster presentation. Especially, it has uncovered the reality of the situation, and serves to defamiliarise popular conceptions of both conference and poster efficacy. The mixed methods approach has furnished quantitative and qualitative data that provides the 'best available evidence' on the effectiveness of academic and scientific poster presentations and how academics perceive their importance in knowledge transfer. Because of the lack of central data concerning conferences and poster publications, it has not been possible to give a precise indication of the number of poster presentations undertaken each year, or related quantifications of use. However, the data-driven development of the research has furnished a range of

data and perspectives to reliably inform the topic, and to promote a reconsideration of our poster practices. These baseline findings may be used to direct larger and more directed studies.

Sub-Study I adopted standard approaches to information retrieval that are seen in health professions literature. However, the results (albeit methodologically sound) offered findings that were inconsistent with the everyday observations of poster practices at conferences. This indicated that a more encompassing search should be conducted, in order to gain a more representative picture of the situation.

Sub-Study II successfully employed a broad-scale mapping review to show the scope and development of the poster medium. By enhancing the review to include discipline publication trends and an overview of the literature themes, it provided a best-evidence picture of trans-disciplinary global poster practice. The information captured in this review clearly demonstrates the scope of global poster practice, and its discussion of the content and trends of the literature offers many important areas for future studies. Furthermore, its analysis of our ability to access and consume information challenges the preconceptions we have about the potential of poster presentations to efficiently transfer and disseminate knowledge to a meaningful audience.

Sub-Study III and Sub-Study IV make pertinent research contributions in reflecting the direct views of poster users. Although the studies are numerically small, further published research (e.g. Rowe 2017a, 2017b) has been undertaken which supports the arguments and conclusions which are presented.

The triangulation of theory and data has lent further support to the arguments put forward in the sub-studies, however, as Sub-Study IV points out (p. 717), although a greater number of responses lends greater surface reliability to study findings, the global population of potential academic/scientific conference delegates comprises millions of researchers and professionals. Given their huge differences in demographics and discipline, it is unrealistic to assume that any study of this type could be conducted which would result in an agreed and unequivocal answer as to the needs and motivations of all conference users. However, the overall findings of the sub-studies and this thesis present the best available evidence to-date.

4. Findings

This section will thematically introduce the findings of the four published sub-studies included in this thesis. Firstly, the baseline knowledge on the scope and function of poster presentation as a medium of knowledge sharing and transfer is explored in sub-studies I and II. Secondly, sub-studies II and IV explore conference delegates' motivations and their evaluations of poster presentations. The sub-study findings are collectively summarised at the end of the section.

4.1 The use and efficacy of poster presentations

In order to examine the baseline knowledge on the function of poster presentation as a medium of knowledge sharing and transfer, Sub-Study I conducted a literature review to empirically determine the effectiveness of poster presentations on knowledge transfer, as represented by changes in participant knowledge, attitude or behaviour. It also examined their effectiveness in comparison with other educational interventions, specifically in the context of health professionals and consumers. Electronic searches of the MEDLINE, Allied and Complementary Medicine, PsycINFO, ERIC and Cochrane Database of Systematic Reviews were conducted in September 2012, for studies published between 1946 and 2012, and the search strategy was adapted for each electronic database (Sub-Study I, p.p. 6-7). A total of 51 studies were identified through the database searches, of which 15 met the inclusion criteria. Six of the identified studies evaluated the poster format as a standalone intervention, six integrated the poster as part of a multi-modal educational intervention, one study trialled different versions of the poster presentation and two studies reported on user experience and opinions on poster presentations (Sub-Study I, p. 6).

Posters as an effective means of knowledge transfer

The first finding of the review was that no studies were identified that evaluated the effectiveness of posters in direct comparison with other educational interventions. This was surprising, given the perceived scope of poster presentation use at ASP conferences. A second finding was that the six studies that reported on the effectiveness of poster presentation as a standalone intervention were unanimous in their conclusions that the poster was not effective at facilitating knowledge transfer be it through an increase in knowledge, change in attitude or behaviour. This was

surprising because conference posters are often presented within the confines of a scheduled poster session, and although they are accompanied by the presenter (who acts as a supplementary source of information), the general literature on poster compilation advocated that academic/scientific posters should be able to act in a standalone capacity (see e.g. MacIntosh-Murray, 2007; Rowe & Ilic, 2009a). In studies that considered poster use in the clinical or workplace setting, posters used as a single intervention did not elicit changes in knowledge, attitudes or behaviour. However, the lack of empirical data highlighted a remarkable information gap about a communication format that is extensively used across a variety of health disciplines to transfer knowledge between researchers, practitioners and end-users. If conference posters are used to share information with an aim of developing knowledge, then their poor potential to effect change (as reflected in the returned literature of Sub-Study I) does not support them as being efficacious as an educational medium. Furthermore, the study notes that poster presentations are not well equipped to accommodate alternative learning preferences; and given its passive nature, if not accompanied by an active intervention (e.g. oral presentation, physical interaction) which can help with aural and verbal learning exchange, the 'traditional' printed poster may only reach a limited proportion of its intended audience. By embedding knowledge in interactions that involve people, it is possible to achieve reciprocal dialogue, which is the most effective method of transferring tacit knowledge (Argote & Ingram, 2000). Pursuing reciprocal dialogue [during poster presentation] facilitates both parties in sharing the socialization process that is involved in achieving mutual understanding and effective knowledge transfer (Argote & Ingram, 2000), yet this had not been studied in the identified literature. Thus, it appeared that despite being a popular medium to present knowledge at conferences, posters were an ineffective means of knowledge transfer. However, as there was a clear lack of baseline research and data, it was therefore necessary to conduct a broader review that firstly established a more detailed picture of the scope and development of poster presentation in the conference setting, and secondly examined how it had been developed over time, and to what purpose.

The scope and development of poster presentation

Sub-Study II conducted an enhanced informetric mapping review (see Methodology section for full description) that examined the published literature on 'poster presentation' from 1937-2015. Its aim was to chart the development and utilization of the poster medium, and to highlight the main literature themes and contributions. Specifically, it looked to answer the following research questions:

1. What are the main fields which use the poster medium?
2. To what extent is it used (in terms of numbers)?
3. How has it been developed since its inception and to what purpose?

Utilizing 249 formal databases and a scholarly search engine for comparative analysis, it yielded 205,442 returns, 253 of which were poster-related texts or articles. Returns were analysed by decade (see Figure 6). Despite the database search filter being set to include only peer-reviewed literature, more than 99% of the total returns were either abstract or title citations to poster presentations made in the conference setting (Sub-Study II, p. 109). A similar result was seen in the Google Scholar returns (Sub-Study II, p. 110).

According to the analysis, from 1990, Medicine was seen to be the chief contributory discipline (see Figure 6c), with other healthcare disciplines making significant contributions (Table 3). Examples of poster use were returned from humanities, social sciences, natural sciences, formal sciences, computer sciences and the professions. These were spread over a total of 58 sub-disciplines and reflected a worldwide authorship. Since the 1990s, medicine has been the main poster user, averaging a 20% lead over its nearest rival over the following years. However, even the least visible fields are seen to contribute large numbers of posters to conferences each year.

Because of the volume of material and inconsistencies in reporting, it was not possible to determine the exact number of posters produced in any given year. A single return could feature either a single citation or more commonly encompass a whole body of poster presentations that had been presented at an event. It was also noted that individual poster sessions can host anywhere from just a few posters, to over 1000. Based on the global number of registered higher education institutions (23, 123), scientific associations and learned societies (17, 500) and the posters they may conceivably host or support, together with the large volumes of data returned by the review, it was viewed that poster presentation is likely to be the most numerically prevalent medium of information dissemination in mainstream conferences.

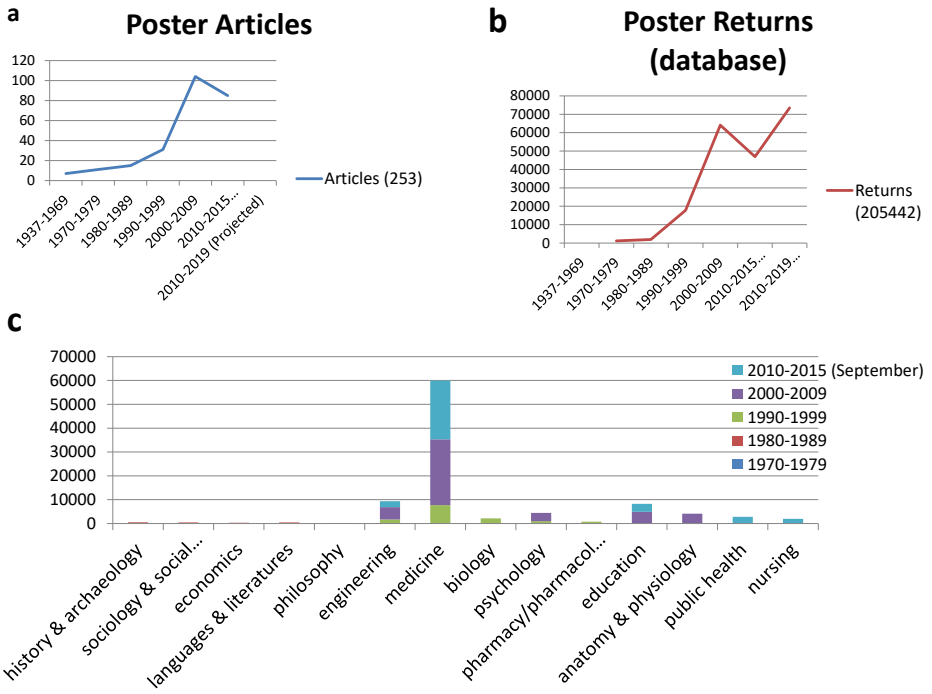


Figure 6. *Poster presentation literature returns (a. poster articles 1937-2015; b. Poster returns (database) 1970-2015; c. poster presentation returns (database) 1970-2015)*

Source: Author

Table 3. *Medicine and healthcare contributions to the poster presentation literature: 1990–2015*

	Database	Medicine	Nursing	Psychology	Anatomy & Physiology	Public Health	Diet & Clinical Nutrition	Pharmacy, Therapeutics& Pharmacology	Physical Therapy	Dentistry	Occupational Therapy & Rehabilitation
1990-99	17787	7730	449	988	1112	454	244	769	220	123	29
2000-09	64140	27614	1717	3477	4138	3073	992	1676	541	613	169
2010-15	46940	24593	1986	1666	1316	2802	564	1000	357	328	227
1980-2015	130832										

Posters as an educational medium

Poster-related literature was retrieved from as early as 1937, when Elliot (1937) studied the effects of presenting advertising information by visual (poster), auditory (recorded message) and combined approaches. Riley (1939) described posters

being used in classroom education and this provides the earliest mention of posters being used as an educational tool. Harte (1974) described poster presentation as a 'lineal descendant' of the scientific exhibits which were seen at conferences in the 1940s–1950s, but they seemed to disappear from use until they re-emerged some 20 years later. The first mention of poster presentations (then termed as display sessions) being conducted at international conferences was in 1969 at the 6th annual meeting of the Federation of European Biochemical Societies (FEBS) in Madrid, Spain. The concept of these sessions was that presenters would display their work, and that viewing delegates could browse and engage one-to-one with presenters as they chose. The 1970s saw poster sessions become an established feature of ASP conferences, and the first published poster instructions date from this time (Harte, 1974). In 1987, Allen, Sheckley and Nelson discuss poster presentation as a continuing education activity, and in the structuring of poster presented information, the 'IMRAD' approach (introduction, methods, results and discussion) was a well-established practice. Ernster and Whelan (1984) viewed that '*With the proliferation of research results, indications are that the majority of presentations at professional annual meetings will soon be in poster rather than oral format*', and this appears to have taken place.

In the 1990s, non-English language poster literature is seen, and discusses similar issues to its English counterpart. From an educational perspective, posters are being used to evaluate nursing students (Handron, 1994; Moule, Judd & Girot, 1998; Fowles, 1992; Wharrad, Allcock & Meal, 1995), as an educational learning experience (Bracher, 1998), and as an educational strategy (Duchin & Sherwood, 1990; Lohri-Posey, 1999). There are side-line discussions of e.g. the confirmation of the legal status of posters as a publication in the US (Adams & Pabst, 2004), but despite massive escalations in poster use, the main literature revolves around poster compilation, and poster presentation is now viewed as a 'marginalized genre' (MacIntosh-Murray, 2007). Some efforts have been made to revitalize the poster medium, and 1995 saw the earliest use of electronic posters which were used in the context of Internet-based conferences in NMR spectroscopy (Hardy et al. 1997). However, even up to the current time, the most common poster session format differs little from the original idea seen in 1969, with delegates browsing large displays of information, and often encountering items of interest only by chance. This perhaps contributes towards the more critical literature seen in the current decade, regarding the quality of information presented in conference posters (Dossett et al., 2012) and educational settings (Kinikin & Hench, (2012), their management(Withers, 2012) and ability to disseminate information effectively (Goodhand et al., 2011; Gordon et al., 2013), their overly textual composition (The Sophist, 2010), and issues of their restricted availability and 'dark data' status (Rowe, 2015; Beck-da-Silva & Rohde, 2011).

The significance of conference outputs as a medium of scientific communication was underlined in the review. The most conservative estimates place poster

presentation at a rate of 1.1 million per year, accounting for each of the world's Higher Education institutions and scholarly societies and associations hosting only one conference each year, and each hosting 50 posters in a poster session (larger events can host 2000+). If the conferences were of a published average size (223 delegates: PWC, 2012) and had a 50% presentation rate, then conference presentations as a whole rise to 4.4 million per year. Given that journal articles are produced somewhere in the region of 2.5 million per year (Ware & Mabe, 2015), this indicates that conference presentations are numerically the major form of scientific communication across academia, the sciences and the professions, by a 76% increase (see the expansion and update on this data provided in §5.2).

It was seen that increases in conference engagement have negatively influenced the management of conference information, and this impacts on their efficacy to inform and transfer knowledge to their target audience. From 1990, an exponential increase in poster presentation was observed, as represented in both Database and Google Scholar returns (Figure 7). A 10% increase was seen in the 1990s on the previous decade, a 40% increase in 2000-2009, and a 5% increase was projected for the current decade.

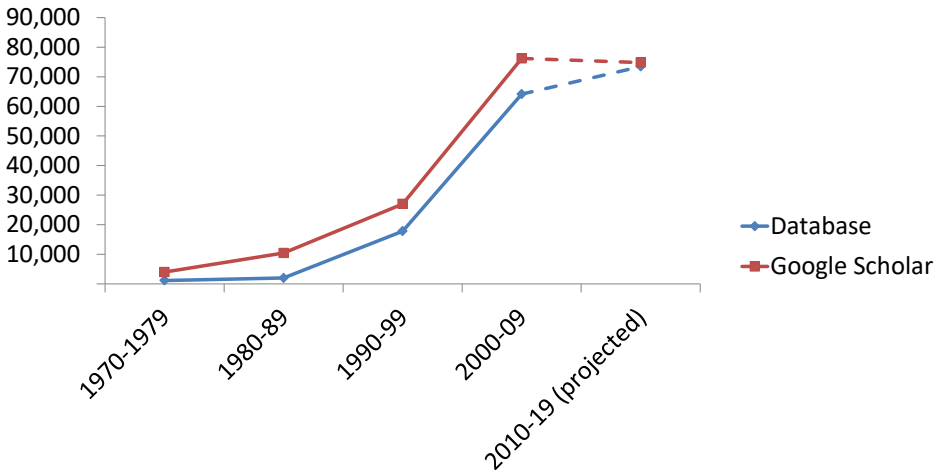


Figure 7. *Returns for 'poster presentation' from databases (249) and Google Scholar search engines: 1970–2019 (projected)*

Source: Author

Managing conference and poster information

Originally, the purpose of poster presentation was to share work with other conference delegates, and to facilitate dialogue and networking amongst researchers. These aims are still feasible at smaller events, but at larger events,

despite these goals becoming increasingly difficult to achieve, poster use still continues to rise.

Even from the 1970s, poster presentation has been perceived as a lesser format than oral presentation (Eisenschitz et al., 1979), and can still be seen as somewhat of a 'country cousin'(MacIntosh-Murray, 2007). More recently, there have been sharp criticisms about the level of attention poster sessions attract and the intentions of those who present, noting especially a lack of one-to-one discussions (e.g. Salzl et al., 2008). Sub-Study I identified the limitations of posters as a standalone medium of knowledge transfer, so it would seem that our motivation to undertake poster presentations may also be affected by other needs, but what these are had not yet been established (Sub-Study II, p. 114).

The practical efficacy of accessing poster-presented information was explored in Sub-Study II (p. 115). Using a session of the American Geophysical Union (AGU) 2013 Fall Meeting as an example, it was noted that only 1.36–2.72% of the published abstracts could have been read by any one individual, with an hour's concentrated reading, using published adult reading capacities. Furthermore, the abstracts of just this one subject area alone would have taken 73.65 hours to read efficiently at 250 effective words per minute (ewpm) / 36.83 h at 500 ewpm, and there were 27 subject areas of similar size at this meeting. The AGU Atmospheric Sciences session had 3654 posters. If a poster contained 1000 words, it would have taken a minimum of 122 h to 'read' all of the posters on display. This does not account for any discussion with the presenter, time spent between posters, personal time or refreshments, or time spent on other aspects of the conference such as exhibitor displays or networking. If only 15 words of a poster title were read to determine interest, it would have needed a minimum of 1.83 h of non-stop reading to simply be aware of the posters on offer.

Despite limiting searches to 'scholarly literature', over 99% of the returns in Sub-Study II led to abstract or title mentions, with no recourse to a fuller output such as a paper or the poster content. These abstracts are extremely limited in terms of the depth of information they can provide and the potential they have as a source of knowledge. Although this point has been discussed as long ago as the 1970s (Reba, 1979; Allen, Sheckley & Nelson, 1987), little has been done to address the problem. Some organizations have online repositories that house poster format information, but again, this is normally only a short abstract or title listing, and rarely offers a poster image or supplementary data (Sub-Study II, p. 118). In redress of this problem, poster authors have looked to self-archive their work on platforms such as F1000 Research and LinkedIn SlideShare, but retrieving information from these platforms is still problematic in terms of searching and available content.

Based on the findings of Sub-Study II, *poster presentation is seen as the most numerically prominent form of scientific communication in the conference setting*, and conference outputs in general are produced in significantly greater numbers than

journal articles. This places *conference outputs as the most numerically predominant form of scientific communication across academia, science and the professions*.

Poster presentation is a global, multi-disciplinary practice, yet it has changed little since its inception. The restrictions of its page-limited format are widely acknowledged, and the masses of posters that are commonly seen at larger events are difficult to manage and consume. As a result, much of the work is missed or encountered only by chance. Beyond the conference event, posters are difficult to access and much of their potential knowledge is inevitably lost. According to a systematic review of the publication rates of work presented at conferences (encompassing 79 studies), more than 50% of conference work is not developed into a full published article (Scherer, Langenberg & Von Elm, 2008), so the level of waste is significant in terms of time, effort and monetary investment. As demonstrated by its wide use in science and academia, the information presented in posters is likely to be both useful and interesting to the global community, but unless a way is found to make this information more accessible, then it will continue to go unseen. In revealing the global utilization and perception of poster presentations at conferences, Sub-Study II upheld the preliminary findings of Sub-Study I that posters are both an unpredictable and ineffective means of transferring knowledge in the conference setting, yet they are still produced on a massive scale. The research therefore proceeded to explore the motivations of conference delegates in regard to their needs, and their evaluations of poster presentations.

4.2 Conference delegate motivations and their evaluations of poster presentations

Sub-Study III looked to obtain perspectives on how the poster medium was seen and valued by poster users. Utilizing a survey methodology, it aimed to achieve a better understanding of the overall concept of poster presentations, within an academic and scientific context. The findings provided information about the delegates' perceptions of publication and conference participation, posters as a presentation and networking medium, and options for poster presentation development. However, due to its relatively small sample (n=37), a series of in-depth expert interviews (Sub-Study IV) was conducted to explore these issues in greater depth. It asked four specific research questions:

1. What are the principle delegate motivations to attend ASP conferences?
2. What do delegates need from their attendance?
3. What value and importance do they place on conferences and conference outputs?
4. How well do conferences meet the needs of delegates?

Conference motivations

In Sub-Study III, conference attendance was viewed as being 'fairly/very important', and 51% of the respondents felt it was important that delegates be given the opportunity to 'present'. The expert interviewees also felt that it was very important to attend conferences ($\bar{x}$8.75/10), which was only slightly different from the results of Sub-Study III ($\bar{x}$8.3). The interview and survey data confirmed that the main motivations to attend academic conferences are to get together to share information, interact, and to discuss matters of professional interest. Doing so was commonly understood to create opportunities of mutual benefit, knowledge development, and forms their core motivation for networking. Within Sub-Studies III and IV, delegate need manifested in a need to demonstrate an effective sharing of knowledge and the quality of their activities, a need to increase their levels of visibility and interaction in the peer community, and a need to have their activities and contributions acknowledged by others. As reflected in many university policies on conference attendance and support, funders want a reason to justify and support conference attendance, and 'presenting' seems to provide this. These requirements of conferences are not generally featured in mainstream conference literature (see Table 2: §2.1) , yet they seem to present significant motivations to attend conferences. However, as the literature suggests that only some 30% of conference research (range 24–78%) is converted to a full paper (e.g. Abicht et al. 2012; Chung et al., 2012; Ha et al., 2008; Meininger et al., 2011: 45% Scherer, Langenberg & Von Elm, 2008), there is a significant chance that the information funded and developed for conference presentation may not be transferred beyond the conference setting (Sub-Study III, p. 3664).

The importance of presentation and publication

Oral presentation was given a high value by both the survey respondents ($\bar{x}$8.25/10) and interviewees ($\bar{x}$9.28/10), whereas poster presentation was given a lower value ($\bar{x}$7.19/10 and $\bar{x}$7.14/10 respectively). Considering the importance of conference presentations overall, the survey respondents valued them at only $\bar{x}$6.63/10, whilst the interviewees rated them slightly higher at $\bar{x}$7.67/10. In comparison, publication in mainstream journals was highly rated at $\bar{x}$9.73/10 / $\bar{x}$9.94/10 respectively. Thus, despite feeling it important to present at conferences, delegates rate the importance of their presentations only as 'fairly important', and significantly lower than mainstream journal publications. In agreement with the literature findings of Sub-Study I, posters were not seen as a particularly good medium for presenting information without the presence of the author ($\bar{x}$3.7/7 / $\bar{x}$4.9/7 respectively), but their perception almost doubled when the author was present ($\bar{x}$6.16/7 / $\bar{x}$6.33/7 respectively), so offering support for the notion that posters have to be supported with supplemental information (i.e. that provided by the presenter), in order to achieve value.

Visibility, access and engagement

Making a visible contribution at conferences was seen to be not only of personal importance, but also of practical importance: '*Colleagues that see you and know you are more likely to engage with you and your students in collaborative work, more likely to give a positive review to your manuscripts, more likely to give you better scores on your grants, and more likely to hire your students*' (Sub-Study IV: participant 5). So, from this perspective, conference presentation is seen as helping with a range of other professional activities. Interviewees also felt that their conference presentations and activities were seen by fellow conference delegates, and therefore contributed favourably to their professional reputation. Despite literature reports that individual poster presentations are visited by only a handful of delegates (e.g. Goodhand et al., 2012), the respondents of Sub-Studies III and IV felt that it was difficult to gain access to poster presenters as (a) there are understandably only short periods when they are present at their poster, (b) being present at their own poster prevented them engaging with other posters at the same time, and (c) high volumes of posters are on display at the same time. This was reflected in the free comments made by respondents, with terms such as: '*impossible to go through*', '*too large*', '*too many posters / too little time*'. In the words of one respondent: '*At a very large conference, there are simply so many that it is not possible to give each one the attention it deserves*' (Sub-Study III, p. 3666). Furthermore, delegates cannot be assumed to have purposefully selected items of interest in advance, and in Sub-Study IV, interviewees read proceedings to determine items of interest with less than a 50% frequency ($\bar{x}$3.25/7), although this was clearly dependent on the size of the conference. This calls into question the assumption that conference delegates purposefully read proceedings in order to determine and prioritize the sessions and individual presentations they will engage with.

In Sub-Study IV, interviewees were asked whether their own posters had gained much meaningful attention at conferences. Although some reported high levels of interest (20-50 visitors), the majority cited single figures. In the expert interviews, posters seemed to attract somewhat negative perceptions, with comments such as: '*Posters are the underdogs of conferences*' (Sub-Study IV: participant 1), '*… you do not really want to publish a poster when it could have been published in a good journal*' (Sub-Study IV: participant 16), and '*Posters are considered kiddy stuff. You don't get a faculty position by being a poster presenter*' (Sub-Study IV: participant 15). It was interesting, however, that in this expert sample, over half had presented 10 or more conference posters themselves.

Subjective and objective value

Conference presentations were given slightly more importance when considered as an addition to a CV (Sub-Study III $\bar{x}$7.68 / Sub-Study IV $\bar{x}$6.81). Most of the expert interviewees acknowledged that they included conference presentations on their CVs, but other than highlighting invited talks or high profile events, they were not

seen as being attractive to outside parties. Demonstrating the value of conference activities after the event took various forms. Informally, interviewees discussed their activities with colleagues, shared materials on professional social media, or provided a conference report to their institution. Conference events were discussed during staff appraisals, with emphasis on outcomes such as benefit, contacts and partnerships, student presentation rates and employment opportunities. Other forms of outcome measurements were whether a presentation had been developed into a journal publication, or whether a poster had won a prize. However, there are no current objective means of evaluating the long-term benefit of our conference activities, and so our ideas of conference value, effective dissemination and making meaningful contacts are often subjective.

In Sub-Study IV, the overall perception of conferences was positive, but in terms of tangible outputs, conference publications are not given much value: '*... nobody cares about them. I see long lists of conference presentations from colleagues who do not publish much in journals – and seem to be 'pretending' that they publish a lot*' (Sub-Study IV: participant 11). Presenting is often viewed as a justification for attending conferences and only 2/16 of the interviewees in Sub-Study IV did not see it as a prerequisite of employers to justify conference funding. However, when asked how important they felt it was for them to present in order to obtain such funding, the interviewees rated it as only fairly important ($\bar{x}$6.68/10). The survey data (of which 51% of the respondents were post-graduate students) gave this more importance ($\bar{x}$7.72/10), and this possibly reflects that senior and more established researchers have less difficulty in accessing funding to support their attendance, and are perhaps better placed to self-fund certain activities. However, in Sub-Study IV, when asked directly if they had ever submitted an abstract just to gain funding to attend a conference, 3/16 (a quarter) of these relatively senior interviewees admitted they had, with another saying that they would if the situation arose. All of the interviewees in Sub-Study IV felt that it was important to ensure that conference attendance was beneficial, but this was not clearly measured or evaluated by their home work environments. One interviewee thought that without offering value for money, conferences '*are just social events*' (Sub-Study IV: participant 11), although conferences were seen to generate personal value in terms of self-improvement, professional practice and development. Whilst one interviewee thought that '*... the Uni and Department can claim some kudos from the total number of people attending [their] conferences ...*' (Sub-Study IV: participant 8), it was also felt that conference activities could '*just become data in a statistic chart or bar*' (Sub-Study IV: participant 13).

Poster development

In both Sub-Study III and Sub-Study IV, the respondents were asked to select options for poster development that they thought might be effective (Figure 8). Congruent with the survey findings of Sub-Study III, the expert interviewees were primarily

in favour of some form of formal on-line publication of poster images, together with a short paper (81.2% vs, 67.8% respectively). This was followed by wanting posters and materials to be hosted online (75% vs. 32.4%). They expressed a wish for poster sessions to be better organized (75% vs. 56.7%) and for poster presenters to be able to give short presentations (68.7% vs. 48.6%), and some form of IT or computer-based form of presentation (56.2%), although the survey respondents in Sub-Study III found this latter option less appealing (13.5%). Both the students and experts expressed a similar wish for poster work to have a wider exposure amongst conference delegates (43.7% vs. 45.9%).

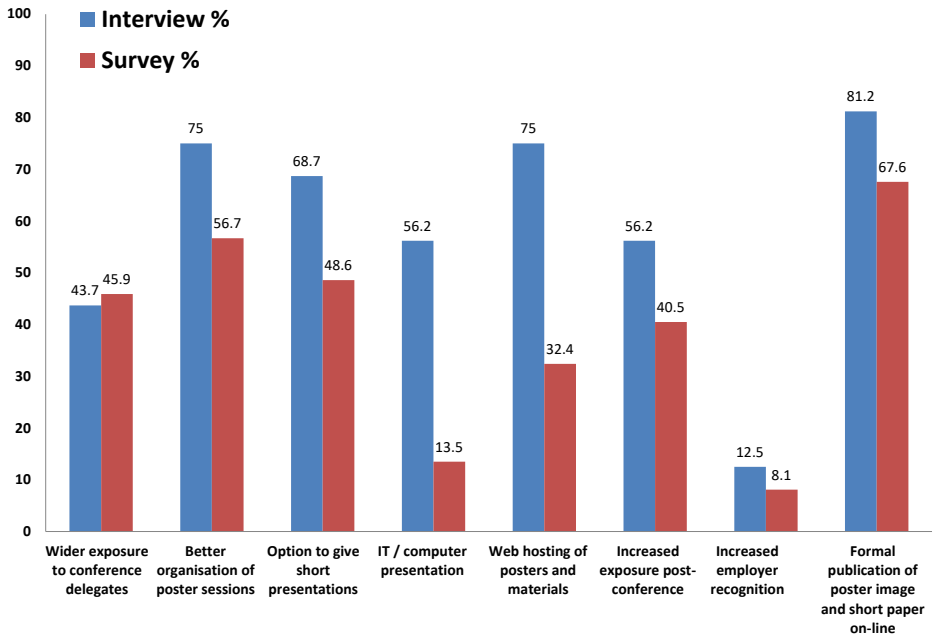


Figure 8. *Preferences for developing the poster presentation format (cross-comparison of survey (Sub-Study III) and interview (Sub-Study IV) data).*

Source: Author

In both Sub-Study III and Sub-Study IV, conference-presented information was not felt to be effectively disseminated beyond the conference event. As far back as 50 years ago, UNESCO (1963) recognized the waste of valuable conference information, and urged for better dissemination and publication practices. Both the literature findings of Sub-Study II and the findings of Sub-Studies III and IV indicate that these issues have gone unaddressed, and this is possibly due to the subjective appreciation of more immediate conference benefits. There is a clear disjunction

between the positive experiences and evaluation we have of conference events, and the effective worth of our conference outputs. The lack of interest and development over the years perhaps reflects an auto-epistemic 'self-knowing' argument that suggests that because our overall conference experiences are positive, these must outweigh any negative issues and they are therefore given little significance. However, the interviews showed that whilst we generally seem to have a 'good time' at conferences, we need more reliable ways to give our conference work wider visibility, meaningful reach, and external value and appreciation (Sub-Study IV, p. 725). The sheer mass of conference information we are faced with shows that the ASP community is willing to contribute to such activities, and to share their research with peers. To quote an interviewee from Sub-Study IV: '*I really like writing articles about my work and related topics, but I feel also being under pressure to have an output as high as possible*' (Sub-Study IV: participant 12), however, despite the weight of posters as a predominant medium of conference presentations, the medium remains undeveloped and underutilized. In the words of another interviewee in Sub-Study IV: '*I am firmly convinced that poster presentation deserves the same kind of respect as paper presentation gets from institutions, academic institutions and the scientific community ... To achieve this kind of recognition a whole restructuring of poster presentation would be advisable*' (Sub-Study IV: participant 2).

The results of Sub-Study IV represented the views of a typical cross-section of experts, and had strong correlations with the findings of Sub-Study III which included both expert and novice researchers. Although they lend substance to the range of opinions expressed in cross-disciplinary literature that support conference attendance (e.g. Hill, 2001; Kim, 2014; Otero-Iglesias, 2017; Palin, 2017), it can be observed that many of these works are still opinion-based. The findings of these sub-studies build on these perspectives, and indicate that senior and junior delegates alike need not only the affordances of a conference gathering, but also tangible outputs that offer them and their financers a return for their investments of time, effort and money.

4.5 Summary of findings

Posters are a well-established way of presenting information at ASP conferences, and at anything other than small-scale events, the poster session is a ubiquitous feature. Despite its familiarity, research on the poster medium tends to be scattered amongst the inter-disciplinary literature, and most of the work produced tends to be of a 'how to' nature, and opinion-based. However, there were emerging studies in the reviewed literature that questioned the efficacy of poster presentations as a means of disseminating research (Goodhand et al., 2011), discussions of posters as a marginalized genre in knowledge communication (MacIntosh-Murray, 2007),

questioning posters as a valid form of publication (Adams & Pabst, 2004), and even the overall worth of poster exhibitions (Salzl et al., 2008). However, such studies were often related to a specific field or event, and lacked the transferable evidence that could examine poster presentation as a cross-disciplinary practice in terms of objectives, function and outcomes. This thesis aims to correct this, and address the overarching research question: *What is the effectiveness of academic and scientific poster presentations and how do academics perceive their importance in knowledge transfer?*

Sub-Study I failed to find evidence that evaluated the effectiveness of posters in direct comparison with other educational interventions. Furthermore, the reviewed studies were unanimous in their conclusions that the poster was not effective at facilitating knowledge transfer be it through an increase in knowledge, change in attitude or behaviour. This ran contrary to the routine poster practices that could be seen at many conference events, where poster presentation was perceived as an established way of sharing knowledge, and to function as a standalone entity as well as a presented medium (MacIntosh-Murray, 2007, p.348). The sub-study concluded that an integrated approach with supplemental material was required to achieve changes in user knowledge, attitude and behaviour, and that well-designed empirical studies are required to establish an evidence base to inform how posters may best be developed and implemented in order to achieve successful knowledge transfer.

Sub-Study II undertook a broader search of the literature, in order to chart the development and utilization of the poster medium, and to highlight the main literature themes and contributions. Poster presentation was established as a common cross-disciplinary practice, with massive levels of engagement and a global spread. Medicine and healthcare are its most prominent user groups, however, even the smallest disciplines showed high levels of engagement. Based on conservative published figures, it was further posed that poster presentation is likely to be the most numerically prevalent medium of information dissemination in mainstream conferences. However, the literature showed that conference poster presentation has not really been developed since its inception in the 1960s, and that the exponential increase in conference engagement from the 1970s has led to delegates being faced with an unmanageable mass of information to absorb. This has had a negative impact on both the effectiveness and perception of poster presentation. Based on published figures, conference outputs can be seen to exceed the annual journal article production by 76%, and this indicates that conference presentations are numerically the major form of scientific communication across academia, the sciences and the professions. However, the increasingly critical themes of the returned literature, together with basic applications of exposure prediction and effective reading rates show that delegates have little opportunity to access and engage with all but a small proportion of the information presented to them, and as a result, much of the research is lost or wasted. This is especially visible in the post-conference dissemination of

information, where the study showed that approximately 70% of conference oral papers and 99% of conference poster presentations are not disseminated beyond an abstract or title mention, and this is inadequate for enabling knowledge transfer. The failure to develop conference presentations is further evidenced by the Cochrane Review of Scherer, Langenberg and von Elm (2008, p. 6), who reviewed 79 reports and over 29,000 abstracts, and found that less than half of all studies, and about 60% of randomized or controlled clinical trials, initially presented as summaries or abstracts at professional meetings are subsequently published as peer-reviewed journal articles. As a final observation, the literature reviewed in Sub-Study II confirmed that poster presentation has long been used as a classroom intervention, is used within higher education as a form of presentation and assessment, and that conferences form a key component of the continuing education and professional development practices of a full range of disciplines and professions. However, conferences are mainly researched in their connection with the Meetings industry, and despite its prominence as a field of scientific communication, there is no established line of educational research related to conference practices and learning in the mainstream literature.

Sub-studies I and II showed a demonstrable degree of lost research in conference events, and the literature questions the efficiency of poster presentation as a medium of knowledge dissemination and transfer. However, published figures (ASAE, 2015; ICCA, 2014; CIC, 2014) all show that conference attendance has grown consistently over recent decades, so it can be surmised that other motivations are involved in poster presentation and conference attendance as a whole. Sub-Study III looked to obtain perspectives on how the poster medium is seen and valued by poster users. The survey respondents confirmed that they felt it was important for them to attend conferences. A hierarchy emerged where oral presentations were valued higher than poster presentations, and this is also reflected in the literature. Poster presentation was not perceived as being effective as a standalone medium, and their limitations in being able to convey a sufficient depth of information were acknowledged. Respondents also confirmed their frustrations with managing the large amounts of information that is commonly on offer at conferences, and this was reflected in their own experiences of limited poster session engagement. Poster presentation was felt to be a good way of networking with fellow delegates, yet poster presenters reported only low levels of engagement with their work. Issues of visibility seemed important for both the presenter as an individual, and also in disseminating their research to others. However, their frustrations with managing the high volumes of information that they are faced with were clear, and they looked for ways that this could be better managed within conference events, and also in disseminating their work to a wider audience after the conference had concluded.

Sub-Study IV examined the motivations that exist to attend and present at conferences in more detail, and from an expert perspective. The main motivations

to attend academic conferences are to get together to share information, interact, and to discuss matters of professional interest. Doing so was commonly understood to create opportunities of mutual benefit, knowledge development, and forms the core motivation for conference networking. Delegates felt a need to demonstrate effective sharing and the quality of their activities, to increase their levels of visibility and interaction, and a need to have their activities and contributions acknowledged by others. However, when they considered how their activities and contributions were viewed and appreciated by others, their needs were not seen as being met. This may explain the mixed opinions on conferences expressed in the literature, and also offers a suggestion that a conference delegate can be both satisfied and dissatisfied with their conference experiences. Expert and novice conference attendees tend to have similar appreciations of both conferences and poster presentation, and the same issues are raised in mainstream literature, albeit un-collated and widely dispersed.

From the literature returns of Sub-Study II it is clear that members of the academic, scientific and professional communities are well motivated to attend conferences, and do so in vast numbers. These events meet their basic desire to congregate, interact, share work and to network with their peers. Conferences entail significant financial commitments and these are often met with external funding. Conceptually, both delegates and funders gain reputation and visibility by presenting work at conferences, but this is limited by unpredictable exposure both during and after the event. Currently, conferences seem to cater well to what delegates want, but in order to address the disparity of opinion regarding their overall value, the survey and interview studies indicate that conference organizers and the higher education sector as a whole need to give more attention to what delegates need.

Importantly, the literature showed that there is a clear lack of research into conference activities, which is surprising given the significant position they hold in formative and continuing education, and also their cross-disciplinary reach across the sciences and professions. As conferences enjoy massive levels of engagement and expenditure, Sub-Study IV asks whether it should be considered as to whether improvements in quality, visibility and output may allow our conference activities to become an additional 'currency' which holds value not only for conference attendees, but also their institutions, funders, and the ASP community as a whole. To underpin such developments, conference learning should be considered as a specific educational domain, and researched to an appropriate level (Sub-Study IV, p. 725). Overall, the cumulative evidence gained from both the literature and from poster users (expert and novice) suggests that our mainstream poster practices are inefficient at presenting information as a standalone medium, and that the required support of presenter engagement is not facilitated in mainstream poster sessions, especially those of larger events. This lack of engagement prevents the presented information being instilled as knowledge, and reduces its potential to be used and applied in other areas. As a result, whilst conference activities are highly valued

amongst the ASP community, the value placed on poster presentation is significantly lower. In addition to the inefficiency of in-conference knowledge dissemination and transfer, the dissemination of conference work to a wider peer audience (through journal article development) is less than 50% effective, and this expands to 99% in the case of the visibility of posters in anything but abstract or title form. In monetary terms, and based on conservative estimates and published studies, the monetary loss for such 'lost research' may amount to over 6 billion Euros (5.38 billion GBP / 6.96 billion USD) every year.

The implications of these findings, and an update on the current situation are presented in the Discussion section of this thesis (§5).

5. Discussion

5.1. Poster presentations as an effective means of scientific communication

This study has explored the issue of poster presentation as a medium of scientific communication in the conference setting. Sub-Study II provided evidence of the wide global usage of poster presentations, and identified them as being a multi-disciplinary practice, with vast amounts being produced each year. From the 1990s, an exponential increase in poster returns can be see, together with an increase in articles published in peer-reviewed literature. Despite this, however, there is a growing recognition of the issues which detract from the medium. This is perhaps more clearly seen in the parallel posts in social media, where poster users (i.e. researchers from various fields who encounter conference posters) express their discontent.

A good example of this is the blog by Iva Cheung, tellingly entitled 'Why academic conference posters suck' (Cheung, 2017). As well as expressing her own dissatisfaction with posters, Cheung gathers the research done on posters that support or illustrate these more widespread issues. Firstly, she reaffirms that there is scant research available on posters, especially research that tests them for e.g. information recall. She also notes issues such as the difficult logistical issues of poster sessions, the cost of producing posters, and the time needed to put a poster together (claiming that compiling a poster can take more time than compiling a conference slide presentation). Using the Google image results for 'best academic posters', she notes that despite a plethora of advice on how to compile a poster being available, most look '*busy, cluttered, and, frankly, exhausting to read*'. Large blocks of text (D'Angelo, 2010) and the inclusion of graphics that '*add no substantive content and don't enhance understanding*' are seen, and she recognizes that academics are not necessarily skilled in graphic design, and get more practice giving oral presentations than they do designing posters, especially if they teach. Posters are not seen as being an effective means of scientific communication, as they are difficult to access, difficult to discover and acquire, often difficult to understand, and subsequently difficult to use as a research or academic resource. She also reinforces the observation made in Sub-Study II that posters are a form of 'grey literature', and in a previous post (Cheung, 2014) has outlined why grey literature sources are almost impossible to discover, and hence have decreased informational value. Especially, she notes that gray literature sources do not have the reach or longevity that they could have, and these issues emerged in both Sub-Study II and Sub-Study IV.

A particular point Cheung (2014) raises is the problem we have in processing overly-large volumes of information. She raises the issue of 'Cognitive load theory' (Plass, Moreno & Brünken, 2010: see original works of Sweller, 1988; Paas & Van Merriënboer, 1993 for further details) which can be divided into three distinct areas, and applied to explain the problems people face when encountering conference poster sessions. Firstly, the *intrinsic load* relates to the experiences of difficulty the material itself poses, and this can be seen in the way the poster is composed, i.e. its readability and clarity. This also involves how it flows, and how well it leads the viewer through the presented information (see Rowe, 2017a, p.p. 83-86 for a full discussion). The *extraneous load* relates to the unproductive mental effort caused by poor instructional design, and in the context of poster sessions, reflects the difficulty we have in locating and selecting items of interest from the often overwhelming choice we are faced with. Lastly, the *germane load* is seen as the productive mental effort learners use to create schemata, and describes a process of thought or behaviour that poster viewers need to organize the categories of information they are presented with, and to determine the relationships among them (DiMaggio, 1997). When viewed in the context of how we turn the information we are presented with in conference posters into usable knowledge (see § 2.2 Knowledge dissemination and transfer), then any difficulties of undertaking discussion or interaction with the poster presenter will severely impact on the way that we are able to extract and generate usable knowledge from the posters we encounter.

Recently, Thomas and Lees-Maffei (2018) have differentiated between posters (as outputs or artefacts) and the poster sessions that accompany them (as processes and events). They define a poster as '*a designed communicative object containing images and text, which is intended to be displayed on a wall (or panel) and to be the focus of discussion in a poster session*', and poster sessions as involving '*the display and discussion of posters as evidence of research and knowledge*' (p. 234). Posters are still seen as needing to be able to act as a standalone medium of knowledge presentation (e.g. Stuckey and Hoyer, 2018; University of Leicester, 2018; Imperial College, 2018). This is also reflected in the plethora of text-laden posters seen in conference halls that attempt to deliver the detail required by poster viewers. However, Sub-Study I found that posters are unable to function as a standalone medium, in terms of influencing a change in viewer attitudes or behaviours, and this has been seen since an early time (Elliot, 1937). Early poster sessions (or demonstration sessions as they were first called) hosted a significantly smaller number of presentations (see Figure 1. of Sub-Study III for a comparative view of poster sessions from 1969 and 2014). This lent a far higher ratio of viewers to posters, and resulted in higher levels of attention and engagement. Accordingly, it was possible to reach a larger proportion of the delegate body, have meaningful conversations about the presented work, and help the transition between presented information, and the transfer of related knowledge. In this sense, poster presentation achieved its aims of effectively

disseminating information to the gathered conference audience, and promoting networking by way of attracting attention, and exchanging knowledge and ideas.

Moving on from these early years, the practice of poster presentation expanded exponentially (see Harte, 1974; Sub-Study II), and the increase in poster numbers in individual sessions meant that the exposure ratio of viewers to posters decreased. In the literature, this is often represented as 'competing for attention', but this masks a bigger issue. As the visibility and exposure of posters decreases, so does their potential to effectively disseminate information, develop knowledge, and form professional links through networking with poster attendees. The literature presented in Sub-Study I demonstrates that posters are unable to function as a standalone medium of knowledge development and transfer, and they need ancillary information to be provided in the form of presenter interaction, +/- supporting materials or media. Especially, both in theory and in practice, interaction is a key requirement to developing knowledge (see sections 2.1; 2.2), and it underpins the aims of conference delegates to share and exchange information, and to discuss matters of mutual professional interest. The desired outcome is that we will leave these events having learned something new, having developed new perspectives on an existing issue, or having been inspired to follow new avenues of research. Although there will be individual instances where conference delegates 'strike pay-dirt' in terms of having gained influential insights or having made a productive networking connection, the evidence suggests that at all but smaller meetings, the potential for this decreases in relation to the amount of people and work we are faced with. As Sub-Study IV points out, we will still have an enjoyable and seemingly productive experience, but in terms of accessing what is on offer and reaching meaningful audiences, we may 'get what we want', but not 'what we need'.

Thus, in terms of presenting information to conference delegates (and beyond), the specific findings of Sub-Study I, the overall collation of the literature findings (Sub-Study II), the triangulation of associated theory (sections 2.1; 2.2; 2.3.2 of this thesis), and the reported experiences of poster users (Sub-Study III and Sub-Study IV) show that as currently used, poster presentations are not an effective means of scientific communication, or of inculcating or generating usable scientific knowledge within ASP communities. As a result, their practical value is limited and unpredictable. However, when seen as a means to actively contribute to conferences, the massive engagement in poster presentation suggests that they do have value to those that present them (and to some extent, those that view them), and this may be reflected in the act of submitting and presenting a poster as meeting a basic desire to congregate, interact, share work and to network with their peers. The efficacy and outcomes of these actions are not clearly visible or measurable as a return for the investments of time, effort and money that conference presentation (or attendance) entails. So, unless such returns are pinned against some concrete markers, any perception of value will remain subjective. As this has not been previously studied,

this perhaps offers some explanation as to why conferences (and poster presentation) have changed little over the past 50 years, other than in scale and number.

5.2 Valuing conferences and poster presentations: the cost of lost conference research

The prevalence of posters at conferences demonstrates that posters have value to individuals, although it is not clear how much of this is attributed to the poster itself, and how much is attributed to attending the conference and the networking this affords. As shown in §1.4, the Finnish Publication Forum (2017) acknowledge none of their listed conference publication channels at Level 3 (top), only 6 (0.19%) at Level 2 (leading), and 935 (29%) at Level 1 (basic). A further 128 (4%) are acknowledged but ungraded at Level 0, and in 2017, 3,165 conferences were removed from their database. The Finnish Publication Forum (2017) state that published conference outputs will be '*taken into account'* in the university funding model, but how this is to be done is not discussed. The low-level of academic appreciation was also reflected in the responses of Sub-Study IV, where all of the international respondents emphasized an institutionally or nationally low level of value being put on conference presentations, and especially poster presentations. So, Finland's position on conference outputs would seemingly reflect similar dispositions around the world, but there is no published research that explores this reasoning, or collates global data to provide a more reliable picture.

Coping with masses of overwhelming information

The individual potential of presented work to transfer information and develop knowledge is reduced when exposure ratios increase, and this decreases the efficiency of academic and scientific poster presentations. The effects of this change in exposure ratio is reflected in the criticisms of posters in the published literature (see Sub-Study II), and also in the responses of Sub-Study III and Sub-Study IV. Not only has this led to frustration, but it has served to devalue the poster medium in the perceptions of the ASP community. Overall, we acknowledge the positive intent of presenting posters (sharing research, inviting discussion, etc.), but we fail to benefit from work that we cannot access, and peers that we do not have the opportunity to interact with.

There is no existing theory of how we react to being faced with overwhelming amounts of information in the conference setting, although the theory of Cognitive Load (Plass, Moreno & Brünken, 2010) helps to predict this quite well (see §5.1). By drawing on the 'paradox of choice' theories proposed by Schwartz (2004), it is possible to expand on how we react and feel when facing poster displays at conferences. As the amount of information on offer increases, our perceptions

increase steadily from a sense of challenge (where it is deemed possible to see/access a significant proportion of what is on offer), to frustration (when we feel that we are unable to see all that we want to see), to resignation (when we resign ourselves to simply browsing through posters in the hope of finding something interesting), to disengagement when we feel incapable or unwilling to meaningfully engage with what is on offer, and subsequently disengage. Schwartz (2004) notes that when faced with overwhelming information or products, our choices in fact become less informed, our experiences become more negative, and we end up making fewer (and worse) choices. When transposed to the conference setting, this results in more work being missed, information access becoming less purposeful, and delegates having less positive conference experiences.

Sub-Study II (p. 115) presented an example of a session of the American Geophysical Union 2013 Fall Meeting, and showed how an application of published reading rates could influence our capacity to access and consume the information on offer. However, this is not an isolated example, and there are more extreme conference scenarios that can be taken into account. In 2017, the American Chemical Society meetings (ACS, 2017a) hosted 9,370 Oral Papers which allowing 20 minutes per presentation amounted to 3,124 hours of presentation. It also hosted 2,720 Posters within 146 sessions. If 6 minutes are allowed to visit and review each poster, it would have taken 272 hours to view all of the posters, and using published the cited reading rates it would have taken 151-302 hours to read all of the poster abstracts (375 word abstracts at 250/500 effective words per minute), and 1.36-2.72 hours to scan the poster titles to determine interest. The April meeting (ACS, 2017b) hosted 14,500 Oral Papers (4,833 hours of presentations on the same reckoning).The 5,700 posters would have taken 570 hours to view, 252-504 hours to read all the abstracts, and 2.85-5.7 hours to scan 15 word poster titles for interest.

To underline the massive use of posters in professional conferences, the Society for Neuroscience (2017) meeting hosted 14,700 posters across 5 days. Given the length of the actual meeting, it is clear that it would be impossible to access or utilize all of the presented information effectively. Thus, given the potential interest of the work to peers who are engaged in the same field, any work that is not seen or that they are not aware of can be viewed as 'lost research'. Presenting a poster at such a meeting is somewhat analogous to being an extra in an epic movie production: Yes, you are 'in' the movie, and there is a remote chance you will be seen on screen when the movie airs, but for the most part, you will be just a distant figure in the crowd. The presentation rate at this type of event seems to be fairly consistent, and figures for the Neuroscience meetings 2013–2017 show little notable variation, ranging between 14,718–15,424 poster presentations. So, whilst conferences of all sizes will be held, it is not possible to ignore that vast amounts of information is presented at such large events.

Thus, according to published literature, theory, and exemplified in the examples provided in this thesis (and especially in the capacity table offered in Appendix 3 of

this thesis): beyond smaller-scale events, we are not able to access or consume the information on offer at conferences in the time which is made available. The same level of information is rarely able to be accessed outside the conference timeframe, and what is available is often restricted in depth of information (e.g. short abstract or title listings), and therefore unsuitable for practical use. Resultantly, we all experience a degree of 'lost research' at larger conferences, and the poor hosting and dissemination of quality conference outputs makes it virtually impossible for us to access or refer to it at a later date. This renders the act of poster presentation relatively ineffective in reaching a meaningful audience, and our related experiences serve to de-value the poster as a medium of scientific communication, and also as an 'academic currency'.

Financial loss

In Sub-Study II (p.112), the discipline of Medicine was highlighted as being the main user of the poster medium, accounting for 45.8% of the returns from 1990–2015 (see Table 3: Sub-Study II findings). Because of a lack of central data and differences in reporting, it is not possible to determine the amount of posters produced by any given discipline, or in any set time period. However, by applying published figures of conference attendance and cost to a reasoned base of global conference providers (HEIs and learned/scholarly societies), conferences have been shown to incur annual costs in the region of 8.9 – 39.9 billion USD at minimum levels (see Rowe, 2017a, p. 16-19). If Medicine is taken to have a 45.8% share of the overall posters presented at conferences (as represented in the data of Sub-Study II), then their total expenditure can be estimated to lie between 4.07–18.27 billion USD per year.

Scherer, Langenberg and von Elm (2008, p. 6) reviewed 79 reports and over 29,000 abstracts (most of which stemmed from the field of Medicine), and found that only 44.5% of studies initially presented as summaries or abstracts at professional meetings are subsequently published as peer-reviewed journal articles. Additionally, of the 12 reports covered in the study which considered oral v. poster publication rates, 11 found higher rates of non-publication for oral presentation, and one study found no difference. Thus, the presumption that oral presentations are more likely to be developed than poster presentations is questionable, and further research is needed. Regardless of this differentiation, however, if this unpublished research is regarded as 'lost' due to its inability to be found beyond the specific conference event (which was recognized as an issue as early as 1963 by UNESCO); then in monetary terms, Medicine can be predicted to waste between 1.86–8.36 billion USD annually on undeveloped research presented at conferences. Given that Sub-Study II found returns from 58 specific specialities (p. 116), then the degree of monetary cost related to non-effective dissemination is likely to be far greater.

It is also important to consider the monetary cost of producing conference presentations from an individual perspective. There has been no previous research

on this topic, however Rowe (2017b) studied the individual expenditures of a conference body (n=835) over two years. Cost factors of road travel were established using a national sample of 21 UK published university reimbursement rates, and air travel cost was calculated using published air mile cost estimations (Cameron 2017). Conference registration fees were generalized to a UK setting using a random national sample of 100 published UK events (n=100). Accommodation costs were generalized using published national rates (Hutchinson 2016). The cost of one week's workplace/institutional support was also factored in, with an average wage based on published national rates for a full cross-section of UK student and academic pay scales. According to the analysis, delegates to this UK conference incurred average costs of £1,568 (€1,759/$1,993) per national delegate, and £2,269 (€2,545/$2,884) per international delegate. National delegates travelled an average of 321 miles to attend the event, at an average cost of £129 per event. International delegates travelled an average of 7,218 flight miles, with an average total cost of £830. As a point of environmental cost, attending this conference raised the individual carbon footprint of delegates by more than 7 times the published normal European daily level of production (EC, 2015). How much of this financial cost is met by individuals, and how much is met by external funders cannot be determined. But, given that conference funding is often reliant on presentation and presentation rates at conferences can be seen to be high, then it is fair to assume that a large proportion of funding which supports conference attendance and presentation is likely to come from external sources, many of which draw on tax-payer contributions and charitable/philanthropic allocations.

The permissible level of the inefficiency of the poster medium will remain subjective unless specific markers are used to identify their existing value, and this also applies to conference outputs as a whole. Although this line of enquiry is still in its formative stages, the figures presented in this thesis can be viewed as a reflection of the return on investment (R.O.I.) we get from presenting at conferences, and administrative sectors (professional and governmental) should determine any need for further research, redress or further development.

Note on estimation parameters

Given the lack of existing data with which to demonstrate the full scope and cost of conference activities, it has been necessary to formulate some estimations, based on available figures and data. However, these can be shown to be highly conservative, and although this lends weight to the scope and cost of conferences, it also indicates that the situation may be significantly underestimated.

Firstly, as there is no collated data to show who hosts conferences, the global number of Higher Education Institutions (CSIC, 2015) has been used, with a conservative estimation that they will host one conference event per year. In reality, many faculties hold their own events and also fund attendance at others.

For example, freedom of information requests to Oxford & Cambridge universities revealed 300-600 conferences being held each year, with anything from 50->1000 delegates. The allowance for a single conference per HEI is therefore an absolute minimum estimation, and numbers are likely to be considerably higher. Some conference alert sites list over 100,000 events, which indicates a significant under-estimation, and so it is conceived that this allocation parameter could safely be doubled to two. As a second consideration, the average number of participants for conference-type meetings without an attached exhibition was 180 attendees (Events Industry Council, 2018). – 43 less than the average of 223 reported in 2014 (PWC, 2014). Altogether they counted for 13.16% of the 1,887,782 meetings, and engaged 17.8% of the participants (Events Industry Council, 2018, p. 8). However, the 2018 report differentiates conferences without exhibitions, from trade shows which includes conventions, conferences and congresses with an exhibit floor. This latter format is popular with mid to large international events, featuring publisher stands and subject related industry stands, but because it is not possible to either combine these figures or to differentiate conference-type meetings from the more business styled trade shows, it is fair to retain the original reported figure of 223 attendees per meeting. A further observation is that generally, whilst it is acknowledged that there are many small meetings (e.g. 10–150 attendees), ASP sector conferences can be seen to have a full range of event sizes, including Medium (150–300), Large (300-600), Mega (600-1000), and Expo (1000-25000) [own formulation]. Although there is no collated data on ASP conference size, it is envisaged that the published figure used is likely to be overly conservative.

Between 2009 and 2016, the meetings industry is seen to have grown by 22.7% in terms of the number of participants (Events Industry Council, 2018, p. 9), and although it is not possible to assign a particular percentage to ASP conferences, it is likely that there has been an associated increase, which underlines the previous allocation parameter as being conservative. The trend has flattened over the last year (Omnipress, 2018), and the US conference/tradeshow market is seen to have increased 0.8%, whilst Europe (-0.8%) and Central / S. America (-0.6%) have seen minor decreases (American Express, 2018, p. 11). Interestingly, there is no available data for Asia.

Previous allocations only accounted for one event being held per registered HEI, and an allocation of 0.5 or 1.0 event being allocated for associations/societies (bi-annual/annual).The number of meetings in the US was seen to grow 1.9% from 2016–2017 (Events Industry Council, 2018, p. 9). Saur (2006) produced the only guide that listed the global volume of registered associations and societies (17,500 in total), and this figure was used to account for this sector of conference provision. The guide has since been discontinued, and there is no alternative source of information. This offers a total of 39,623 global meetings of published average size (30,873 if association meetings are biannual). However, given that HEIs are likely

to hold more than one event per year, and that the Events Industry Council (2018, p. 9) records 248,485 meetings for non-exhibition conferences in the US alone, the utilized parameter is likely to be hugely under-estimated. As a final consideration, the estimates of delegate cost have been proposed using published figures. A common cost component is air travel, and the cited cost was based on published calculations, dating from 2013 (Cameron, 2013). Since 2013, airfares have risen by an aggregate of 7% (Statista.com, 2018), so the calculation of airfare cost is likely to be proportionally understated.

As an update to this economic perspective (unpublished at time of writing), the above study data-set has been expanded to a 3-year delegate sample (n=1,261 delegates). Using the same parameters of fees, accommodation travel reimbursement and paid support, the median conference expenditure of delegates is seen to be £1,723 per delegate (-10% variance). However, updating the parameters of HEI distribution (CSIC, 2018) and using the Union of International Associations (UIA, 2018) reported median for active associations and learned societies, the current projections indicate 56,202 conference events per year, with a total of 12,533,046 attendances (based on the existing published figure). Again assuming a conservative presentation rate of 50%, the 6,266,523 conference presentations that this would produce would exceed the most current estimations of journal article production (in the region of 3 million: Johnson, Watkinson, & Mabe, 2018 p.5) by 110%. Applying the study's average cost finding of £1,763 per delegate to the UNESCO global researcher distribution (UNESCO, 2015) would amount to an incredible £GB 22,095,760,098 ($US 28,981,516,689 / € 25,133,119,350) cost expenditure for our annual global conference activity. This is higher than the national GDP of the last 36 nations listed by the United Nations in 2017. Furthermore, an updated study on the development of conference papers to published journal articles has seen our conversion drop from 45% in 2007, to 37.3% in 2018 (Scherer et al., 2018), so underlining the potential loss of conference presented research. When applied to the global researcher distribution (UNESCO, 2015), these new figures indicate a potential annual cost in lost or unpublished conference research of £GB 6,927,020,791 ($US 8,750,119,730/ € 7,694,664,100).

5.3 Reliability and ethical issues

Although a proponent of interpretivism, Willis (2007 p.194) acknowledges that different people and groups will have different perceptions of the world. So, in this research, multiple perspectives were sought in order to offer a baseline understanding that reflected the wider ASP community (Creswell, 2008). In relation to the publications summarised in this thesis, *reliability* is taken to mean the repeatability of the findings (can the study be reliably replicated?), and *validity* is taken to mean

the credibility or believability of the research, especially given the multi-disciplinary context of the subject. In this thesis, the triangulation of different sources of data and the solicitation of feedback from members of the ASP community were used to support the reliability and validity of the research, and expert peer-review was employed to examine the published sub-studies included (Simon & Goes, 2011).

Sub-Study I aimed to '[...] *empirically determine the effectiveness of poster presentations on knowledge transfer in health professionals and consumers*' (Sub-Study I, p. 6). Full methodological details were provided to enable replication, including the search term formulations and the six databases used. However, whilst offering a reliable representation of the current research on the topic, these results appeared to lack validity when considering conference-type posters, as opposed to the informational posters which may be used in the community. The paper clearly discussed the conference setting (Sub-Study I, p. 4–5), yet the results (in terms of the dearth of available research) were not congruent with what was presumed to be a massive, multi-disciplinary (as defined in line with Jensenius, 2012) activity. In particular, we asked ourselves why such a large body of supposedly sensible people would pursue an activity that appeared to be ineffective in achieving the presumed aims of knowledge dissemination and transfer? It became clear that there was no baseline research that established the scope or application of ASP poster practices, nor was there any clear expression of what poster presentations were designed to accomplish (beyond an opinion-based level) or whether this was achieved. Accordingly, the enhanced mapping review of Sub-Study II was carried out, with a background motivation to maximise the data capture regarding poster presentation, and so offer a more robust perspective that could be seen as representative of the general ASP community.

Sub-Study II presents the most comprehensive investigation of poster presentation to-date, in terms of establishing its published research corpus, practices and reported issues. In order to ensure the representativeness of the data capture, although a limiter was set to return only peer-reviewed literature, the search term was left open and there were no limiters placed on date or language. From a methodological perspective, a standard mapping review (Grant & Booth, 2009, pp. 94, 97-98) looks to '*map out and categorize existing literature from which to commission further reviews and/or primary research by identifying gaps in research literature. Completeness of searching determined by time/scope constraints*'. In order to thematically structure the mass of data retrieved, and also to aid the presentation of the findings in both quantitative and qualitative terms, this methodology was enhanced to offer a fuller picture of the situation of poster presentation. No similar literature review approach existed in mainstream practice at the time of writing (see Grant & Booth, 2009; Hart, 2018), hence its non-standard label.

The reliability of the study was further reinforced with a full methodological description (p. 108), the supplementary listing of the 249 databases used, and also

a cross-comparison using an open access scholarly search engine (Google Scholar). The potential limitations of the study (for example the exclusion of derivative terms) were fully discussed and rationalised in the published article (Sub-Study II, p.p. 119-120). It was acknowledged that the use of derivative search terms such as 'poster', 'posters', 'poster sessions' may have yielded differing results, but it is not envisaged that any meaningfully different data would have been retrieved to contradict the general findings of the review. The review was successful in terms of establishing the main fields that use the poster medium, offering an indication of the extent to which it is used, and as a documentation of how poster presentation has been used since its inception. As no central data is available that gives direct measurements of poster production, and with an acknowledgement that no search of this scale can be 100% effective, then despite its size and detail, Sub-Study II can only claim to be reliably indicative of the development and conditions of poster presentation, and not fully representative. However, the triangulation of different sources of data (Simon & Goes, 2011; Flick, Kardoff & Steinke, 2004, p. 180) involved 249 separate databases, and an open-access scholarly search engine that has been estimated to capture at least 87% of the documents that are available on the Web (Madian & Lee, 2014).

The review also noted that the search term approaches that can be used in literature reviews had a practical impact on what was returned, and this has an influence on how the returns can be seen as a representation of available research. In Sub-Study II, the review was conducted using the open search term of 'poster presentation'. The overall returned data stemmed from 58 specialities and offered >119 000 returns from the databases [all reviewed] and >370 000 from Google Scholar [0.95% reviewed]. When restricted to a title-only search (poster AND presentation), only 2403 returns were offered, 2217 of which were classed as scholarly and peer-reviewed. However, when the first 200 returns were reviewed (all listed as journal articles), they led only to abstract citations. Because they are often housed under 'articles' entitled 'Poster Presentations', it is unlikely that poster abstracts will feature prominently in key word or title searches, even if they exist and are directly related to the search topic. It is also clear that even if poster findings are published in mainstream journals, it is not currently practical to search for them without considerable effort (Sub-Study II, p. 116). The ranking, collation and classification algorithms that each database and search facility employs differ widely, and the difference in returns shows that although refining a search to title-only may appear to give more relevant search results, this is not necessarily the case. This was further demonstrated by repeating the search from a Library and Information Science perspective, and although 'poster presentation(s)' was a highly popular return in an open search, it did not feature at all in a title-only search. Thus, the review concluded that when searching for information, open search approaches should at least be examined to verify if an advanced database search represents a true picture of the sources potentially available. Only the development of centralised and

dedicated research in this area will improve on this baseline knowledge, however, the quantitative aspects of the study are confirmable through the cited methodological detail, and the triangulation of multiple sources lends to the transferability and credibility of the findings (Shenton, 2004).

In regard to saturation and representivity, in isolation, the small scale surveys and interview series featured in Sub-Study III and Sub-Study IV of this thesis may seem inadequate to represent the beliefs and opinions of such a large target population. It is not disputed that a greater number of responses diminishes the potential for data to be missed, and thus lends a greater reliability to study findings. However, the ASP community spans approximately 23,00 HEIs, 1,500 associations/societies, 8.4 million researchers, 1300 disciplines/sub-disciplines, and innumerable professions (Sub-Study II, p. 116; Rowe, 2017a, p. 18; Rowe, 2017b). So, given the differences in opinion and perspectives that can be expected in such a diverse body, even the largest studies would yield commensurately inadequate volumes of data. In this research, by espousing an interpretivist approach, the individual reality of poster presentation was sought until a level of saturation was reached and no new perspectives were being offered. Sub-Study III is acknowledged as offering a small-scale study of a particular event population, and because of the limited response it generated, its findings are of limited use. However, the results are presented as being reliable in terms of methodological application and analysis, and when viewed in conjunction with findings or opinions presented in contemporary literature (detailed in Sub-Studies I and II, and supported through the supplied citations), they can also be seen to have validity. Specifically, the qualitative aspects of the study were discussed in relation to the general usage of poster presentation across the ASP community, in order to allow readers to contextualize the findings to their own settings and experiences (Shenton, 2004). As an additional point: in qualitative research, premeditated approaches to sampling are discouraged (see e.g. Mason, 2010), and expertise in the chosen topic can further reduce the number of participants needed in a study (Jette, Grover, & Keck, 2003). As such, the indicative value of the survey responses and their correlation with contemporary observations (Sub-Study III) was seen to support a more in-depth study being carried out.

Saturation and representivity is also discussed in Sub-Study IV. Given the differences in demographics and disciplines that can be seen in the global ASP community, it is unrealistic to assume that any study of this type could be conducted which would result in an agreed and unequivocal answer as to the needs and motivations of *all* conference users. However, as the results of the study correlate with those of the preceding survey and previous literature (e.g. Sub-Studies II and III; Mair, 2010; Rowe & Ilic, 2009), they may be seen as contextually valid. The responses offered by this expert interview sample also reflected views that were expressed in contemporary literature, and may therefore be seen to reflect the general perspectives of a typical cross-section of expert ASP conference attendees

(the demographics and disciplinary details of the interviewees are given in Sub-Study IV, p. 718). Some differences of opinion were seen, but this also features in the limited existent literature.

According to the evaluations of Sub-Study IV, the interview data appeared rich and provided answers to the posed research questions. By triangulating the findings of Sub-Study II, Sub-Study III and Sub-Study IV with existing multi-disciplinary literature, the overall findings of the thesis may be seen as being representative of the ASP sector that features in conference and poster literature, and thus forms a baseline from which more targeted studies can be conducted.

Because of the two relatively small-scale studies included in this thesis, it is perhaps necessary to comment on the level of evidence this research brings to the field. According to Kanazawa (2008), there are common misconceptions about the requirements and weight of scientific proof. He views that:

> *'Proofs exist only in mathematics and logic, not in science. Mathematics and logic are both closed, self-contained systems of propositions, whereas science is empirical and deals with nature as it exists. The primary criterion and standard of evaluation of scientific theory is evidence, not proof. All else equal (such as internal logical consistency and parsimony), scientists prefer theories for which there is more and better evidence to theories for which there is less and worse evidence. Proofs are not the currency of science.'*

He continues to say that: '[...] *scientific knowledge is tentative and provisional, and nothing is final. There is no such thing as final proven knowledge in science. The currently accepted theory of a phenomenon is simply the best explanation for it among all available alternatives*.' In agreement with this view, it is claimed that in the absence of contesting or alternative theories or research, the concepts presented in this thesis represent the best available evidence that we currently have on the topic, and present a base from which further and more directed research can be conducted. However, without such a baseline investigation, the selection of more refined (and possibly more confirmable) areas of investigation would have been difficult to justify. This work provides that baseline investigation and highlights areas for future study.

As regards the authenticity of this research, this thesis and the included publications are solely the work of the author. All references to secondary sources are acknowledged, and where existing thought has been applied to a particular context, the originating works are clearly identified. The resulting conclusions and conceptualisations are claimed as the author's own work.

It is acknowledged that investigations into this field are happening elsewhere, and due to the de-centralised nature of conference activity and reporting, there will likely be other work that follows themes presented in this research. However, the mapping review of poster presentations (Sub-Study II) and Rowe (2017a) both

feature uniquely thorough listings of international work on the topic, and offer full search rationales and comprehensive bibliographies. At the time of writing, the works featured in this thesis can be seen as having captured and acknowledged the mainstream contemporary literature of the field.

The survey component of this research (Sub-Study III) was approved by the Research Ethics Committee of the University of Lapland (dnro 187/00.05/2014). The change in data collection (from Survey to Message-based Interview – Sub-Study IV) was notified on 30.09.2015, and there were no other changes to the research plan originally provided.

The researcher's position

As stated in the introduction to this thesis (§1.1), I first started to research poster presentation in 2008, following my own first experiences of presenting a poster at an international conference on evidence-based medicine. During the process, I observed the low levels of interaction between poster presenters and poster viewers, and as the conference progressed, the levels of poster session engagement appeared to dwindle. During the conference 'down-time', I struck up a conversation with Professor Dragan Ilic, who is now head of the Medical Education Research and Quality unit at the School of Public Health and Preventive Medicine at Monash University, Australia. We discussed the ideals behind poster presentation, and in particular, the way that the limitations of a page-bound display and the passive nature of poster sessions impacted upon the depth of information that posters could contain, and the limited numbers of people posters could reach. We subsequently produced a range of poster-related works, including published journal articles and opinion pieces (Rowe & Ilic, 2009a; Rowe & Ilic, 2009b; Rowe & Ilic, 2011), with an initial focus on broadening the depth of poster presentation by way of incorporating multi-media links. I presented our ideas at a number of conferences in the UK (Rowe & Ilic, 2008a; Rowe, 2008b; Rowe, 2009) as well as presenting digital prototypes that demonstrated the concept (Rowe & Ilic, 2008c; Rowe, 2009), but found it difficult to convey the underlying importance of why such a well-established medium needed to be revised. Understandably, Professor Ilic returned his focus to the field of medical education, and although I contributed a book chapter on the way that posters serve to visualize knowledge in a process of knowledge transfer (Rowe, 2012), I felt that the concept of posters and conferences needed a broader examination, that better reflected the everyday experiences of our ASP community.

Following my move to Finland in 2010 for family reasons, the 'easiest' way forward seemed to be to undertake a PhD that examined the topic. When researching the literature on posters, the first thing that struck me was that although I believed poster presentation to be a widely practiced activity, there was scant coverage in the literature. On the surface, voices were generally supportive, but much of what was written was opinion-based, and lacked specific analysis and evidence. However,

there was an undercurrent that mirrored my own perceptions, and bemoaned the functional value and perception of posters. As my research progressed, it became clear that although people seemed to attend conferences for the purpose of their professional and educational development (in terms of accessing the latest research and interacting intellectually with their peers), nobody appeared interested in whether their activities were, in fact, effective. This stance reflected my own conference experiences, and although I tended to have a 'good time' at such events, the tangible benefits of my activities were often unclear. My mission therefore became two-fold. Firstly, I felt I had to fill the knowledge gap on poster presentation by providing a comprehensive account of how posters featured in our conference activities, and how they functioned as a medium of scientific communication. As my research progressed, I not only uncovered evidence concerning their extensive use, but in analyzing their mechanism, I began to become aware of how their mainstream use was not conductive to achieving the aims of knowledge dissemination or directly related networking. However, my general experience was that I was 'swimming against the tide', and that despite the negative evidence that was coming to light, a global ASP community seemed somewhat unconvinced of its effectual impact. I published the book '*Academic & Scientific Poster Presentation - A Modern Comprehensive Guide*' with a major publisher (Rowe, 2017a) and as a foundational text, it appears to have been well received (Nycyk, 2018). But, as a second objective, I felt I had to bring the issue of conferences and posters to the attention of the academic community, and along the way, I have used non-academic media to express my thoughts, including guest blog posts (e.g. The EuroScientist; Conference Inference; Faculty of 1000 Research), academic fiction published in educational magazines (Rowe, 2015b), and published feature articles (Rowe, 2018).

However, the main evidence-based arguments which examine the place and value of poster presentation in the ASP community comprise the contents of this thesis, and accordingly, I have tried to separate my own experiences and perceptions as a researcher and member of the academic community from the processes and interactions that have featured in this research. In the literature analysis, I have sought to objectively theme and explore the issues raised, and lend voice and to some degree empower those who have extended their opinions and experiences (Lather, 1991). Because of the thin distribution of these voices across the multi-disciplinary literature and the absence of any mainstream research that collates these voices, it has been a driving objective of my research to bring together the available evidence, and to present it as rigorously as possible. However, doing so has not been easy, and at times it has been difficult not to feel as if I am a lone voice in the wilderness.

To substantiate to these voices (and inevitably my own), I have sought to triangulate evidence that supports and reasons the positions taken. Although differences in opinion are inevitable when undertaking such a broad course of research, I have been fortunate that the evidence I have retrieved has wholly served

to support my arguments. It is acknowledged that this research line is novel and unique, and that alternative perspectives will emerge as more data becomes available. However, its findings represent the best-available evidence, and presents a balanced and reasoned picture of the current situation. Especially, the broad collation of evidence supports my perception that I have been objective and detached when interpreting the data. Hooks (1984 cited Harrison, MacGibbon & Morton, 2001) observed that '*researchers, in the academy and elsewhere, are increasingly answerable to their communities of origin and to their communities of interest*', and as a researcher, I have taken this not so much as an obligation, but more as an opportunity to make a meaningful contribution. Thus, despite the research being a singularly lonely endeavor, the self-perceived need to 'make a difference' has been forefront in my mind throughout the research process.

In regard to the interactions I had with research participants, Sub-Study III took the form of a paper distributed survey, with no direct interaction with the respondents. Sub-Study IV comprised of 16 expert interviews, conducted by reciprocal message exchange. None of the interviewees were known to me, and none were engaged in my research area. As a mixed-method study, the qualitative responses were often paired with a quantitative expression of importance or value, so this helped to comparatively evaluate the replies. Only when responses were unclear, or they presented an interesting line of discussion were discussions entered into, and to some extent, the message-based approach shielded me from the reciprocal challenges mentioned by Harrison, MacGibbon & Morton (2001). Additionally, despite sharing conferences as a common experience, the diversity of nationalities and disciplines ensured a degree of separation that negated any concerns of 'researching in my own [academic] backyard' (Hull, 2017).

6. Conclusions

6.1 The potential of conferences as educational opportunities and scientific communication

Conferences have been shown to be a major medium of scientific communication and continuing education / continuing professional development, far beyond the level of recognition shown in educational or ASP literature. They are engaged with on a global scale, and their outputs can be seen to significantly exceed the number of journal publications every year. Prominent in these outputs are poster presentations, yet their efficacy as a means to disseminate knowledge is questionable from theoretical, publishing and experiential standpoints.

The knowledge potential of conference outputs has been questioned at an international level since 1963 (UNESCO, 1963), yet little change has occurred in how these outputs are disseminated either during or after the conference event has taken place. Fjordback Søndergaard, Andersen, and Hjørland, (2003) cite the UNISIST model of scientific and technical communication published in 1971 (p. 281), and provide empirical and theoretical reasons for updating it. Especially, they note that much has happened in the developments of electronic communication that needs to be considered, and that differences between different disciplines and domains are not sufficiently recognized. Electronic communication has served to connect a global population of researchers, in effect, breaking down the pre-existing geographical distances that prevented their direct interaction, and facilitating new modes of communication (e.g. email communication and professional social media platforms), and the way that information is shared, published and accessed (e.g. online repositories, web pages, and online publications and proceedings). As a result, such changes have created a 'global ASP community' and increased our potential to access a wider range of information sources, and formulate a greater depth of inter-disciplinary research. In-short, we are no longer so strongly confined by institutional, disciplinary or national perspectives, and our research and connections can take on a wider, more encompassing perspective.

Hurd (2000) also noted the way that computer and web-based technologies have changed the way scientists communicate, but highlighted our on-going reliance on the refereed scientific journal as the '*key delivery mechanism*' for research findings. She notes a passage of completed research being assembled into conference reports, that are then published in conference proceedings, and indexed by library/information

science facilities. However, this does not take place to any great effect. Although vast amounts of work is presented at conferences, the findings of this thesis and its included sub-studies show that it cannot be effectively consumed on-site due to our capacity to access and consume only a certain amount of information in a given time. Moreover, at anything other than small-scale events, proceedings themselves are difficult to manage and delegates cannot be relied on to have read them effectively. Whilst IT-based developments can be seen in terms of presentation media (e.g. PowerPoint slides to accompany oral presentation, computer assisted compilation of posters, digital proceedings, and online repositories of conference content), they have not been used to enhance either the global dissemination or usable depth of information of conference outputs. Technological means exist that can help in all of these areas, but not to take advantage of such developments can be seen as remiss, and effectively denies people access to available information. Subsequently, this restricts the useful potential of research to be analysed from different perspectives, as well as its potential to do good. Hurd (2000, pp.1281-1283) proposed a model in which scientific communication was enhanced by the use of pre-print servers, e-journals and aggregator sites, and the potential of this for managing conference-based information is expounded in the Recommendations for Practice and Further Research (§5.8) of this thesis.

Conferences generate vast amounts of knowledge in the form of the oral and poster presentations that are presented, yet they are difficult to access and use to their full potential. The research presented in this thesis has shown that mainstream poster practices are inefficient at presenting information as a standalone medium, and that the required support of presenter engagement is not facilitated in mainstream poster sessions, especially those of larger events. This lack of engagement prevents presented information being instilled as knowledge, and thus reduces its potential to be used and applied in other areas. Beyond the conference event, less than half of the information presented in conferences is developed into a journal publication, and conference outputs are often restricted in how they are published in proceedings (e.g. as a full paper, short abstract, or title). In the case of poster presentations, it was found that in over 99% of the returned literature, the only visible trace of such presentations was a short abstract or a title mention. The research also showed that an abstract is only a representation of a larger body of information, and that posters (as a standalone entity) are not able to convey a suitable amount of information for practical use. As such, the poster presentation itself allows the points shown on the poster to be expanded on and discussed, and it is this process that allows knowledge to be shared and generated. However, the potential for engagement and interaction at anything but small-scale conferences is dramatically reduced when faced with masses of presented information, so much of what is on offer is either missed by a meaningful proportion of the delegate body, or encountered only by chance.

The need to access such data is exemplified in the observation of Butte (2012), who observed that: '*Hiding within those mounds of data is knowledge that could change the life of a patient, or change the world. If I don't analyze those data and show others how to do it, too, I fear that no one will.*' The cost of not accessing such information is one of 'lost research', and can be assessed in terms of the harm or lack of progress that not using such information could have, as well as losses in terms of the time, effort and financial resources researchers commit to undertaking conference presentations. In the research on poster presentation covered in this thesis, Medicine was seen to be the largest user of the poster medium, and its 'lost research' was estimated at an annual cost of 1.86–8.36 billion USD. Overall, despite the slow recovery from the global recession of 2008–2009, most countries monitored by the OECD (2018a) have either maintained or increased their levels of spending on tertiary education, with the notable exception of the USA. The number of researchers employed in research and development has also grown (OECD, 2018b), and this would seem to have links with the increasing growth of conferences reported in thesis. However, there is a consistent urge for an efficient use of resources (in terms of financial, human and knowledge capital), and also an expectation of a suitable return on investment for our spending.

The needs of conference delegates are subjective, but focus on a desire to congregate, interact, share work, and to network with their peers. Poster presentations seem to facilitate conference engagement, but are not effective as a medium of knowledge transfer or development, due to their restricted presentational format and their inability to predictably reach a meaningful proportion of the ASP community. Because of these restrictions, poster presentations are under-valued as an 'academic currency', and retain a secondary status to their oral presentation counterparts. There is no evidence that suggests that poster presentations are inferior to oral presentations in terms of academic rigour, but their depth of detail is often explored in direct discussions between presenters and viewers, and this is not a feature that can be included in any subsequent publication as a short abstract or title mention.

Published statistics and reports (ASAE, 2015; ICCA, 2014; CIC, 2014) all show that conference attendance has grown consistently over recent decades, and this suggests that conferences provide certain affordances to delegates, and that they serve their purpose. Chemero (2003, p. 181) differentiates between the plain perceptions we have of a physical environment (e.g. the conference venue), and the meaning-conferring inferences we gather from a '*meaning-laden environment*' (e.g. how personally beneficial we feel the conference experience to be). This has strong ties to theories of affordance (Gibson, 1979; Chemero, 2003) that consider what we 'get' from an environment. The process of attending a conference exposes us to '*environmental relata*' (Chemero, 2003) which in this context are things like the venue itself (which gathers people together), the programme (which directs people to gather in groups for a purpose), or by offering a platform from which

to present. By exposure to this environment, a delegate has the potential to share information, interact, and to discuss matters of professional interest. There are certainly instances when this takes place, and combined with positive experiences such as travel, a break from routine and professional socialization, this accounts for the positive perceptions of conferences (Sub-Study IV). When viewed together with the continued positive trends in conference provision, it would appear that delegate requirements are being met, but this was not shown in the overall study data. Differences in opinion, value and importance all featured within the data, and although there were constant positive reflections as to the general worth of conferences, these became less predictable as specific issues were investigated (Sub-Study IV, p. 723).

In regard to the efficacy of knowledge dissemination, conferences do not appear to be predictably efficient, and this is especially borne out in the findings of the sub-studies which relate to poster presentation practices. It is therefore important to decide whether current conference practices deliver a return that is commensurate with our high levels of engagement, and our related investments of time, effort and money. As shown in the concepts of information dissemination outlined earlier in this thesis (§2.5), at many events, information is made potentially *available* to delegates (e.g. in conference proceedings and programs (hard copy or on-line), abstracts and papers published before or after the conference, poster displays (non-structured),and virtual sessions (non-structured)); but it will only be accessed by those who actively investigate the information channel (e.g. read proceedings or repositories), or who encounter the information by chance (e.g. whilst browsing poster displays). In Sub-Study IV, less than 50% of the expert interviewees said they actively read all of the proceedings, so a reliance on chance becomes more likely. Thus, the process of conference information dissemination is passive in terms of potential learning and knowledge consumption/generation. More active means of information dissemination involve the formal presentations which are delivered to a gathered audience (e.g. oral presentations and structured poster presentations). This also extends to further disseminating information (full papers and presentations) via published conference proceedings (hardcopy or on-line), special issue series, web sites, web profiles, blogs, etc. If knowledge transfer and generation are to be achieved, then the information presented at conferences also needs to be purposefully discussed between delegates and/or presenters. These discussions will culminate in an acknowledged comprehension of the presented information, together with a conception of how it relates to the receiving party's own context. At small-scale events this can be facilitated, but at larger events, the potential for this to occur is reduced by the presence of busy schedules, and an overwhelming amount of information. The paradox of choice (see §5.2) and cognitive load theories (see §5.1) presented earlier indicate not only that efficient knowledge exchange will be unlikely to occur, but also that delegates' needs to congregate, interact, share work

and to network with their peers will only be met at a subjective level. As observed in Sub-Study IV (p. 725):

> *'As conferences enjoy massive levels of engagement and expenditure, it should be considered whether improvements in quality, visibility and output may allow our conference activities to become an additional "currency" which holds value not only for conference attendees, but also their institutions, funders, and the ASP community as a whole. To underpin such developments, conference learning should be considered as a specific educational domain, and researched to an appropriate level.'*

The levels of engagement in poster presentation and the professed intentions of poster presenters to share and discuss their work with peers suggest poster presentation is a valid and accepted educational practice. Following the process of abductive reasoning proposed by Pierce (1935), the outcome of such presentations should be positive accounts of poster interactions that reflect a general efficacy to transfer information and generate knowledge, with evidence of tangible outcomes. The surprising finding of Sub-Study I was that there was no evidence to show that posters were an effective means of knowledge transfer (especially when used as a standalone medium of conference presentation), yet this is precisely how they tend to be used in mainstream conference practices worldwide. Sub-Study II confirmed this wide usage, and identified an absence of substantiated evidence that upheld posters being an affective educational medium, and also a line of discourse that questioned their effective purpose. The study hypothesised that posters had alternative functions in facilitating conference attendance and networking at events, and this was explored in sub-studies III and IV by investigating the motivations of conference attendees, and their perceptions of poster presentation. The triangulation of data concerning the visible publication of poster-presented data, and also theories that refute our inability to predictably access and consume the information we are faced with (see Appendix 3) challenge our assumptions of the educational efficacy of posters, and 're-cases' (Timmerman & Tavory, 2012) poster presentation as an educational medium that serves the modern ASP community. To reiterate the methodological statement made earlier in §3.2.2: The concept of inverted abductive reasoning has been proposed to reflect the findings of this thesis, in that whilst both the general literature and the continuing education sector reflect conference activities as being educationally motivated and educationally beneficial, there are few tangible markers of conference outputs being appreciated as an 'academic currency', so their educational efficacy is, in fact, questionable.

In judging the efficacy of educational interventions, Barber and Rizvi (2013) developed an efficacy framework as a practical approach to improving learner outcomes. Presented as the Pearson Efficacy Framework, it asks questions related

to the outcomes. evidence, planning and implementation, and the capacity to deliver of learning interventions. Applying this framework to the practice of poster presentation as a continuing educational medium (Table 4) shows that whilst the overall evaluation of educational efficacy is poor, there is genuine reason to believe that meaningful change can be affected, once the significance of the current situation is known, and its implications are considered.

The cost of this inefficiency is visible in terms of the time, effort and financial resources we commit to our on-going poster practices, but whether this is sustainable in terms of return on investment, or in serving the knowledge economy of the global ASP community is questionable. However, it is hoped that the representations of current practices and perceptions described in this thesis will encourage individuals, disciplines and institutional/governmental bodies to reconsider how our efforts may be maximised to better serve the societies who ultimately fund them.

6.2 Contribution of the research

This research presents a number of contributions to research that either contribute new and novel findings to the knowledge corpus, challenge our existing thoughts on conference practices, or raise new areas for research and development. The findings and contributions are dealt with here on a sub-study basis, with an acknowledgement of how the work adds to the literature. The educational implications of the use of poster presentation are confirmed from a number of perspectives. Firstly, conferences and poster presentation are historically established as an established feature of continuing education practices, in that they expose delegates to new and emergent knowledge. The motivations of ASP conference delegates are primarily education-oriented as they seek to access and share current knowledge. Although conference learning is not yet an established field within educational studies, the practical links to education are clear, in that attendees (especially medical and education professionals) can accrue Continuing Professional Development/Education (CPD/E) points and certificates of attendance that can be used to show their on-going development for professional registration purposes. There is also a clear connection between the attendee backgrounds of those who attend conferences, and the higher education base that either grounds their work as researchers/educators, or provides the educational base for their professional occupation. Together with the historical documentation of the development of conferences being led by higher educational institutions, and also the use of posters in classroom, university and conference settings, it can be seen that incongruent with the current situation where conferences fall under the general purview of the MICE industry sector, ASP conference delegates and events have specific needs and orientations that need them to be considered as a specific educational field.

Table 4. *The efficacy of poster presentation when evaluated as an educational medium under the Pearson Efficacy Framework.*

	Indicators	Overall Rating
Intended outcomes	• Outcomes are not documented or specific as recognised in the ASP literature • People within and outside organisations do not understand the intended outcomes or communicate them in the same way. • Targets do not exist to measure outcomes against. • Outcomes are only defined at a high (subjective) level.	Poor
Overall design	• The design does not meet target group expectations and is difficult to use effectively. • The design does not reflect intended outcomes. • The design does not allow for the collection of feedback. • The design is specific to a local situation and cannot be replicated or explored effectively by outside parties.	Poor
Value for money	• No significant feedback from users exists (either formal or informal), and the benefits of using this product/service are unclear as expressed in current reporting and literature. • Perceptions of value for money and user experience are poor.	Poor
Comprehen-siveness of evidence	• Evidence of poster efficacy and concrete outcome is collected via a limited range of methods and does not balance qualitative and quantitative sources. • Evidence is mainly anecdotal and patchy, and does not take into account the product/service's life cycle, features, or users. • Evidence from the target group is scant, regarding their needs or the specific product/service.	Poor
Quality of evidence	• The evidence that does exist is not directly linked to what poster users are looking to achieve. • The evidence that exists is biased toward the subjective needs of the poster presenter, in the wider conference setting. It does not stem from relevant use of the product/service, and reflects out of date practices that have not kept pace with increases of use and contemporary need. • The evidence is not representative of how learners would use this product/service, given the potential for development using existing media and technologies.	Poor
Application of evidence	• The evidence that is presented via the poster medium cannot be accessed quickly via electronic means. • The design of poster presentation has not been changed as the result of evidence produced to-date. • Major decisions and practices about poster presentation are not underpinned by evidence.	Poor
Governance, monitoring & reporting	• Conferences are a global and multi-disciplinary activity, but there is no research stream that reports on them as a continuing educational pursuit. • There is little to no feedback to users, funding or educational bodies.	Poor

Internal capacity & culture to achieve change	• The ASP community has the right number of people with the appropriate skills and experience to affect change. • Our educational and professional culture is focused on delivering outcomes, and is collaborative and innovative. • Considering the engagement and outlay in conference activities, in order to address the issues of efficacy and loss in poster presentation, it is foreseeable that an appropriate budget can be made available. • Leaders across the sector are likely to understand and support the need for development.	Good
User capacity & culture	• The target group understand the objectives of scientific communication, but their roles have mainly been focused on subjective needs and activities that are beneficial to the individual. Given the lack of central research, individual users have not had the drive to affect change, and the lack of central reporting has likely resulted in organizations, funders and governmental bodies being unaware of the scope of the problem.	Fair
Stakeholder relationships	• The ASP community is widespread, but has strong national and international links. Collaboration and cooperation are likely to be supported and engaged in, once the scope of the issue becomes known.	Good

Sub-Study I found no evidence that poster presentations are effective in promoting knowledge transfer, and no studies that directly compared the effectiveness of poster presentations to other educational interventions. Furthermore, it found that poster presentations tended to achieve success in increasing knowledge, changing attitudes and behaviours when integrated with other educational interventions. This ties in with the early observations of Elliot (1937), however in contemporary accounts, posters are contradictorily represented as having to function as a standalone medium (see Sub-Study II, p. 109; MacIntosh-Murray, 2007; Rowe, 2017a). These findings suggest that despite its popular presence at ASP conferences, poster presentation is unlikely to achieve knowledge transfer in standalone form, and that posters in their current format are not an effective means of knowledge transfer.

No clear evidence existed in regard to the scope, utilization and function of poster presentation. As such, it was difficult to conceptualize the significance of conference and poster practices in the context of higher/continuing education, and in the professional development practices of the global ASP community. In order to address this baseline deficit in knowledge, Sub-Study II mapped the general development and use of posters from 1937 to 2015, together with indicative evidence of their use across disciplines and their rates of dissemination in peer-reviewed literature. The output of this review provides the base-line evidence of how the poster presentation medium has been used and developed, which was previously lacking. As well as providing a comprehensive record of how poster presentation features in the area of international scientific communication, Sub-Study II also raises questions of efficacy, and offered evidence that seemingly simple matters such as what we require

poster presentations to do, how posters work, and how much we commit to them (e.g. our time, effort and money) had not been established beyond an opinion level. The review documented increasingly negative accounts of poster presentation, and raised questions surrounding the motivations of their authors (which had first been raised by UNESCO, 1963). In order to demonstrate the difficulties in managing poster presented information, the concept of reading capacity was used to challenge the ideas that presented work is either deliberately pre-selected for viewing, or that any significant proportion of what is on offer could be accessed or consumed by potentially interested audiences. This challenge has since been followed up in more depth (e.g. Rowe, 2017a) and alternative theoretical means of explaining the way that we process poster presented information are provided in this thesis. Accordingly, it is shown that beyond a limited amount, we are incapable of consuming all but a small degree of the information that is presented at conferences (see Appendix 3 for examples), and thus, the educational and practical potential of such work is also limited.

Extending this beyond the conference boundaries, a main finding of Sub-Study II was that over 99% of the peer-reviewed returns for 'poster presentation' led only to title or short abstract mentions of posters that had been presented at conferences. This has dual implications in that poster presentations are represented beyond the event mainly in abstract or title form, and unless the presented research is supported by either author interaction or a fuller text provision, then this shortened form is inadequate for either quality assessment or information provision (content depth). As such, the published outputs of what has been shown to be the predominant medium of conference presentation are often of insignificant value in terms of their potential to transfer knowledge.

The limited reporting of poster presentations also represents a massive area of potentially lost research. Studies of oral presentations show that only some 30-45% of oral presentations are developed into published journal articles, and this drops to less than 1% with poster presentations. Thus, the cost implications of this observation show a potentially massive loss of both information and money on an annual scale. In order to anchor this efficiency against a level of generalizable investment (i.e. return Vs. expenditure and cost), the published spending contributions of the meetings industry (see Rowe 2017b for details) have been refined with a differentiation of the ASP sector, and a theoretical estimation of the annual global conference expenditure offers expenditures of $8.9–39.9 billion USD p.a. (see Rowe 2017a, p. 16–19 for a full analysis). Furthermore, an evidence-based costing has been applied in a two year study of international conference delegates (N=835), and when generalized, the results offer an annual expenditure of $11.5–14.7 billion USD (Rowe 2017b). Thus, the significance of this research is evident in terms of demonstrating poster presentation's predictable potential for effective knowledge transfer and dissemination, as well as indicating the massive cost implications for

any deficiencies in this area. As conference attendance continues to grow by some 10% every year (Rowe, 2017a, p. 137) and poster practices continue in much the same form that they did 50 years ago, these findings have significant implications for the knowledge and financial economies of the global ASP community.

The analysis of the needs and motivations of conference attendees, and their perceptions of poster presentation showed that poster presentation may be undertaken by both students and more experienced presenters alike, and is thus undeserving of its generalised perception as a junior activity. The work also reinforced the view that unsupported posters offered an inadequate depth of information and highlighted the difficulties ASP delegates face in managing large displays of information. However, despite feeling that posters attracted limited and unpredictable amounts of attention, the respondents felt they were a good conference networking tool. Given the contradictory situation of poster sessions entailing negative experiences, but attracting massive levels of engagement, this thesis establishes for the first time the delegate perceptions of what poster presentation sessions are meant to achieve, and how they meet the needs and expectations of poster users.

Sub-Study IV presents the first set of findings to differentiate between the basic capacity of conferences to meet delegates' subjective needs to congregate, interact, share work and to network with their peers, and the deeper need of delegates for such practices to have effective and tangible outcomes. In light of the incontestable limitations to individuals processing large volumes of information (e.g. Sub-Study II, p. 115: Sub-Study III, p. 3661-3662; Rowe, 2017a), the work revives UNESCO's (1963) contention that even if conference work is being produced for seemingly legitimate reasons, its efficacy is both unpredictable and untenable. This is especially significant when viewed in conjunction with work identifying the massive scope (Sub-Study II) and expenditure (Rowe, 2017a, 2017b) of conference activities, and also the rates of 'lost research' cited in Sub-Study II. Although a superficially small interview series (N=16), it supports the survey responses of Sub-Study III and also previous work by Rowe and Ilic (2009a) and Mair (2010). Furthermore, the thesis challenges the unsupported assumption that conferences and poster presentations are efficient mediums of scientific communication, and in doing so, it serves to defamiliarise a relatively under-researched area of practice. A generalized perception or assumption that the actions of conference attendees are desirable, proper, or appropriate implies a legitimacy of our socially constructed systems of norms, values, beliefs and definitions (Suchman, 1995). This can be said of conference practices, and the concepts of getting together to discuss professional issues, sharing information, maintaining one's own knowledge, demonstrating expertise etc., all of which are markers of secondary professional activity (Dent & Whitehead, 2013; Dent, Bourgeault, Denis, & Kuhlmann, 2016). Thus, it is not surprising that ASP conferences are viewed favourably and maintain a high level of popularity. However, given the vast range in conference sizes, types and quality, and our proven ability

to consume only a finite amount of information in a set time (see Sub-Study II, p. 115; Rowe, 2017a, pp.48, 73-74; Appendix 3), there will always be those who have successful experiences, and those who do not. As such, the positive and negative opinions regarding conferences may each be legitimate, even though they appear to be contradictory. This is a highly important observation, and forwards a challenging explanation of *why we do what we do* in regard to conference attendance.

Summary

Although further research needs to be undertaken to explore this in greater depth, the overall work presented in this thesis has contributed some significant findings:

1. Conferences are established as a truly global and multidisciplinary practice, and if estimated using conservative published figures, conference outputs outnumber journal articles as the major medium of scientific communication.

2. Posters are established as a major form of conference presentation, yet contrary to popular literature they are shown to be challenged as standalone entities of knowledge transfer, and unpredictable as a method of knowledge dissemination. At larger-scale events our potential to pre-select work is highly questionable, and the volume of information makes engaging with individual works a matter of luck, rather than judgement.

3. Beyond physical events, poster-presented information is poorly disseminated, to the extent where less than 1% may emerge as a utilisable knowledge resource. Conference presentations are shown in theory and practice to have a multi-billion expenditure, yet the returns we have on our investments of time, effort and money are incommensurate, and when allied to cost markers, they are seen to be unsustainable.

Whilst the research presented in this thesis does not offer a complete solution to the issues of conferences and poster presentation, it offers a reasoned and relatively substantiated argument for conducting immediate research and development in this area. The work particularly underlines Scotland's (2012) view that '*Researchers need to take a position regarding their perceptions of how things really are and how things really work*', and despite its foundational contribution, this thesis highlights key areas for future research and development. From a quantified perspective, the massive multi-disciplinary nature of poster presentation, together with its associated human and monetary resource commitments act as strong indicators of its international significance.

In terms of singularity, the thesis undertakes a unique formal examination of poster presentation at academic, scientific and professional conferences. Conferences

and poster practices are well established and familiar pursuits, however there is little evidence-based research that examines them. The presented work corrects this imbalance and the significance of the findings serves in a sense, to defamiliarise us with what we think we already know. As well as mapping the scope and place of poster presentations in trans-disciplinary and global contexts for the first time, the work triangulates existing theory to offer new perspectives on a phenomenon that we have seemed to have taken for granted, viewed from subjective positions of common sense, and have left collectively un-challenged and unexplored. Many of the findings and applications of the presented research are new, and thus problematize the area of conferences and posters, so challenging those involved to transform these situations to improve their function and efficacy.

The work makes no claim to be originary, in that conferences and posters are an established and conceptually familiar area. However, there is no specific field that addresses these phenomena outside of a Meetings Industry context, although ad hoc investigations and discussions occur within disciplines. Across disciplines, higher education is a consistent reference in conference practices, in that many ASP conference delegates will either be employed or enrolled in higher education institutions, or follow professions that have a higher education foundation. So, any study of conferences and their elements would seem to fit logically within the higher education purview. In revealing this context, and also in light of its novel findings and theoretical applications, the originality of the work is clear.

6.4 Recommendations for practice and further research

Based on the findings of this research, some recommendations for further practice are offered.

1. Due to their significant place in the continuing education and professional development practices of a global, multi-disciplinary community, conference practices require a dedicated strain of research. Due to the presence of higher education as a common denominator in such events (in terms of the objectives of learning and continuing/professional education), and also the higher education base of the institutions and foundational qualifications of the ASP professionals who engage in them, Higher Education is seen as the field to lead such research.

2. From a practical perspective, conferences and poster sessions have undergone little change in the last 50 years. Particularly, they have failed to take advantage of the advancements in information and computer technology that have taken place over the same period. Many technologies currently exist

that can be harnessed to address issues that relate to information management and meeting conference user's needs. An example of how this may be approached is shown in the platform concept presented by Rowe (2017c) that urged a central approach to managing conference information (Figure 9). Using existing technologies, it is possible to construct a central system that can be used by conference users (individuals, institutions, conference organizers and funders) and a wide range of professional and governmental bodies to structure the way conference information is submitted, evaluated, disseminated and stored. The concept expands the time-and-place confines of physical events, and offers technologies that can control the flow of conference-generated knowledge to external audiences, and promotes the development and monitoring of conference outputs to form them into a valid 'academic currency' that brings benefit to a truly global ASP community.

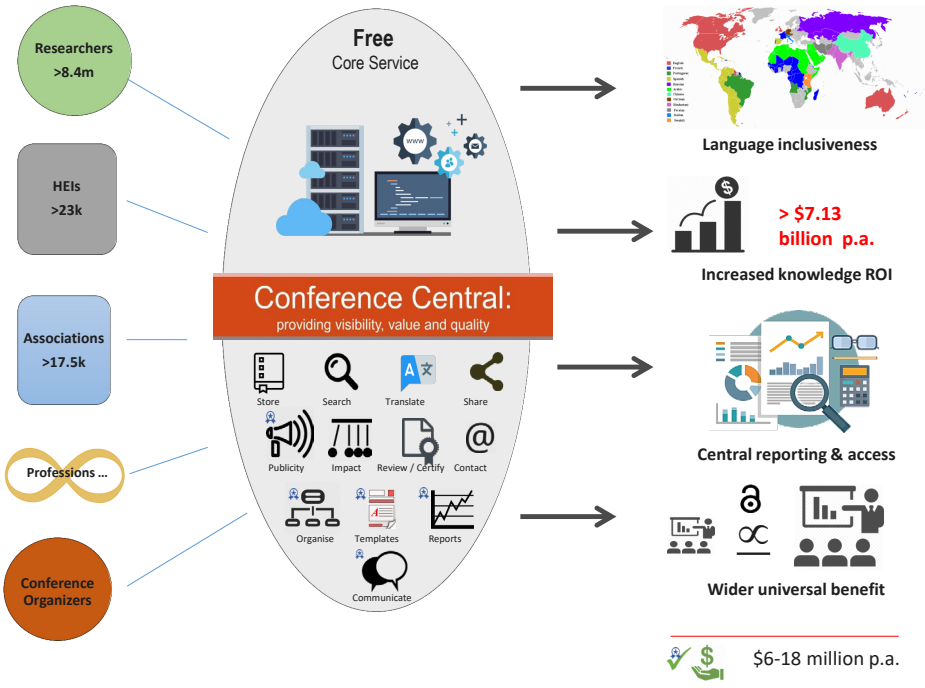


Figure 9. *'Conference Central': a conceptual approach to centrally managing conference information (Assembled, based on the findings of the four sub-studies introduced in this thesis, and first presented in the Falling Walls Lab – Turku, 15.09.2017: Rowe, 2017c).*

There is potential to increase the depth of usable information to others (with web-based storage of e.g. full papers, imagery and audio / video media instead of only short abstracts and title mentions), and to facilitate various forms of access and review. It is also possible to auto-translate text and audio into a wide range of languages, and to recognise and report conference outputs on an individual, institutional and national/international levels. Such a service would provide equal opportunities for small and large events, and the improved communication would extend the longevity of outputs. This type of innovation would ultimately serve to address issues raised in the literature, and enable conference activities to provide a more worthwhile means of scientific communication.

3. Given the evidence and new findings presented in this thesis, individuals, institutions, funding bodies and conference organisers are urged to reconsider the aims of poster presentation (and conference presentation as a whole), and take steps to ensure that the activities we undertake offer a meaningful contribution to our fields, that can be utilised by a globally connected ASP community. Particularly, it is important that posters are supported by well-structured poster sessions, with short presentations where possible. In addition to the short abstracts included in conference proceedings, any hosting of presented materials should include a short paper where the topic can be expanded on to include more detail, and a copy of the poster image that can be referred to. As alternative means of providing information, presenters can submit a podcast audio file (e.g. 3 minutes) where they talk about their work, or a video file of the same nature. It should also be considered whether presenters are able to submit supplementary work in their own language, and whether auto-translation technology may be used to make this more accessible to a global audience. Additionally, thought should be given as to whether conference materials should be made open access, and if their review or quality assurance could be enhanced with better communication with authors, and the use of post-publication peer-review processes. This may improve both the quality and longevity of conference outputs, and raise their value within the ASP community.

As a final consideration, institutions and governmental bodies should consider firstly the massive amounts of human and monetary resources that are committed to conference engagement on a yearly basis. Within this thesis, preliminary estimates (based on published figures) show a multi-billion economic commitment, and these figures are clearly conservative. It is further shown that only 45% (37.3% as of 2018) of oral and <1% of poster presentations are published beyond the conference event in the form of a journal article. This has been recognised as 'wasted research', and in the

current economic conditions, it is not a level of waste we can continue to support. It is therefore down to over-arching bodies to instigate and support developments that help to address this inefficiency, and make conference participation and publication a more worthwhile activity, with concrete and demonstrable outputs that support a globally connected ASP community.

References

Abicht, B. P., Donnenwerth, M. P., Borkosky, S. L., Plovanich, E. J., & Roukis, T. S. (2012). Publication rates of poster presentations at the American college of foot and ankle surgeons annual scientific conference between 1999 and 2008. *The Journal of Foot & Ankle Surgery*, *51*(1), 45-49. doi: 10.1053/j.jfas.2011.05.009

Academia.edu. (2018). About Academia.edu. Retrieved from: https://www.academia.edu/about (Accessed 29.07.2018)

Ackoff, R. L. (1989). From data to wisdom. *Journal of Applied Systems Analysis, 16*(1), 3-9.

ACS [American Chemical Society]. (2017a). American Chemical Society meeting - August 20-24, 2017). Retrieved from: https://cen.acs.org/articles/95/i31/254th-ACS-National-Meeting.html, (Accessed 09.08.2017)

ACS [American Chemical Society]. (2017b). ACS Meeting 2017: Advanced Materials, Technologies, Systems & Processes. 02-06 April, San Francisco, USA.

Adams, B. K., & Pabst, P. (2004). Is a poster presentation really a "Printed Publication?". *Tissue Eng*, *10*(11-12), 1841-1842. doi: 10.1089/ten.2004.10.1841

ADDA [Anxiety & Depression Association of America]. (2018). *2018 Conference Continuing Education Credits*. Retrieved from: https://adaa.org/resources-professionals/conference/ce-cme-credits (Accessed 30.05.2018).

Allen, G., Sheckley, B., & Nelson, W. (1987). Continuing Education Activities of Connecticut Psychologists. *Professional Psychology: Research and Practice*, *18*(1), 78-80. doi: 10.1037/0735-7028.18.1.78

Altman, D. G. & Bland, J. M. (2005). Standard deviations and standard errors. *BMJ*, 331, p. 903. doi: 10.1136/bmj.331.7521.903

American Express. (2018). *2018 Global Meetings and Events Forecast*. Jersey City: American Express Meetings & Events. Retrieved from: https://www.amexglobalbusinesstravel.com/content/uploads/2017/12/2018-Global-Meetings-Forecast-US.pdf

American Geophysical Union. (2017). *AGU Fall Meeting 2017*. 11-15 December, New Orleans, USA.

American Psychological Association. (2010). *The Publication Manual of the American Psychological Association* (Sixth Edition). Washington, D.C.: American Psychological Association.

Andersen, M., & Wahlgren, B. (2015). Conference evaluation focusing on learning and transfer. *Journal of Multidisciplinary Evaluation*, *11*(25), 34-50.

APHA [American Public Health Association]. (2018). *Continuing Education at the APHA Annual Meeting*. Retrieved from: https://www.apha.org/professional-development/continuing-education/continuing-education-at-the-annual-meeting (Accessed 30.05.2018).

Aramo-Immonen, H., Jussila, J., & Huhtamäki, J. (2015). Exploring co-learning behavior of conference participants with visual network analysis of Twitter data. *Computers in Human Behavior*, *51*(B), 1154-1162. doi: 10.1016/j.chb.2015.02.033

Arellano, D. E., Goodman, D. A., Howlette, T., Kroelinger, C. D., Law, M., Phillips, D., ... & Fitzgerald, M. (2014). Evaluation of the 2012 18th Maternal and Child Health (MCH) Epidemiology and 22nd CityMatCH MCH Urban Leadership Conference: Six Month Impact on Science, Program, and Policy. *Maternal and Child Health Journal*, *18*(7), 1565-1571. doi. 10.1007/s1099

Argote, L., & Ingram, P. (2000). Knowledge transfer: a basis for competitive advantage in firms. *Organizational Behaviour and Human Decision Processes*, *82*(1), 150–169. doi: 10.1006/obhd.2000.2893

ASAE [American Society of Association Executives]. (2015). How many associations are there? Retrieved from http://www.asaecenter.org/AboutUs/

Australian Business Deans Council. (2018). Master Journal List. Retrieved from: http://www.abdc.edu.au/master-journal-list.php?title=&issn=&for=1&rating=

Barber, M. & Rizvi, S (2013) *Efficacy Framework: A Practical Approach to Improving Learner Outcomes*. London: Pearson plc. Retrieved from: https://www.pearson.com/content/dam/one-dot-com/one-dot-com/global/Files/efficacy-and-research/methods/Efficacy-Workbook.pdf.

Barnlund, D. (1970). A transactional model of communication. In: C. Mortensen [Ed.], *Communication Theory* (2nd ed.), (pp 47–57). New Jersey: Transaction Publishers.

BECA [Business Events Council of Australia]. (2015). *The Value of Business Events to Australia (2015)*. Business Events Council of Australia. Retrieved from: http://www.businesseventscouncil.org.au/files/View_Report.pdf

Beck-da-Silva, L., & Rohde, L. E. (2011). Poster: a practice to be revised. *Arq Bras Cardiol*, *97*(2), e37-e38. doi: 10.1590/S0066-782X2011001100018

Ben-Nun, P. (2008). Respondent fatigue. In: P. J. Lavrakas [Ed.]. *Encyclopedia of Survey Research Methods* (pp. 742-743). Thousand Oaks, CA: SAGE.

Birks, M., & Mills, J. (2015). *Grounded theory: A practical guide*. London: SAGE.

Borgmann, H., DeWitt, S., Tsaur, I., Haferkamp, A., & Loeb, S. (2015). Novel survey disseminated through Twitter supports its utility for networking, disseminating research, advocacy, clinical practice and other professional goals. *Canadian Urological Association Journal*, *9*(9-10), e713-717. doi: 10.5489/cuaj.3014

Borrego, M., Douglas, E. P., & Amelink, C. T. (2009). Quantitative, qualitative, and mixed research methods in engineering education. *Journal of Engineering Education*, *98*(1), 53-66. doi: 10.1002/j.2168-9830.2009.tb01005.x

Boucouvalas, M. (1985). How to profit from attending a conference. *New Directions for Adult and Continuing Education*, 28, 43-56.

Boulding, K. E. (1955). Notes on the information concept. *Exploration,* 6, 103-112.

Bracher, L., Cantrell, J., & Wilkie, K. (1998). The process of poster presentation: a valuable learning experience. *Medical Teacher* 1998, 20(6), 552-557. doi: 10.1080/01421599880274

Breiter, D, & Milman, A (2006). Attendees' needs and service priorities in a large convention center: application of the importance-performance theory, *Tourism Management*, *27*(6), 1364-1370. doi: 10.1016/j.tourman.2005.09.008

Brownlie, D. (2007).Towards effective poster presentations: an annotated bibliography. *European Journal of Marketing*, 41, 1245-1283. doi: 10.1108/03090560710821161

Butte, A. (2012). King of the Mountain: Digging Data for a Healthier World. *Stanford Medicine* [online], Summer 2012. Retrieved from: http://sm.stanford.edu/archive/stanmed/2012summer/article3.html

Caena, F. (2011). *Literature review - Quality in Teachers' continuing professional development*. Education and training 2020: Thematic Working Group 'Professional Development of Teachers'. European Commission. Retrieved from: http://ec.europa.eu/dgs/education_culture/repository/education/policy /strategic-framework/doc/teacher-development_en.pdf

Camden Conference. (2018). *Continuing Education for Teachers*. Retrieved from: https://www.camdenconference.org/continuing-education-units-for-teachers-2/ (accessed 30.05.2018).

Cameron, M. (2013). Airline fare analysis: comparing cost per mile. Rome2Rio Pty Ltd. Retrieved from: https://www.rome2rio.com/blog/2013/01/02/170779446/

Cheesman, B. (1975). Conference des Fauconnieres [Charles D'Arcussia - seigneur d'Esparron]. *Union Catalogue of Scientific Libraries in the University of Cambridge: Scientific Conference Proceedings, 1644–1972* [§549 Bal 44.4090]. London: Mansell.

Chemero, A. (2003). An outline of a theory of affordances. *Ecological Psychology 15*(2): 181-195. doi: 10.1207/S15326969ECO1502_5

Cheung, B., Wong, C. L., Gardhouse, A., Frank, C., & Budd, L. (2018). # CGS2015: An Evaluation of Twitter Use at the Canadian Geriatrics Society Annual Scientific Meeting. *Canadian Geriatrics Journal*, *21*(2), 166. doi: 10.5770/cgj.21.302

Cheung, I, (2014). Grey matters: Why NGOs should start thinking like self-publishers [online]. Retrieved from: https://www.ivacheung.com/2017/10/academic-conference-posters-suck/ (Accessed 14.08.2018)

Cheung, I, (2017). Why academic conference posters suck [online]. Retrieved from: https://www.ivacheung.com/2017/10/academic-conference-posters-suck/ (Accessed 14.08.2018)

Chung, K. J., Lee, J. H., Kim, Y. H., Kim, T. G., & Ha, J. H. (2012). How many presentations are published as full papers? *Archives of Plastic Surgery*, *39*(3), 238-43. doi: 10.5999/aps.2012.39.3.238

CIC [Conference Industry Council]. (2014). *The economic significance of meetings to the US economy. Interim Study Update for 2012 (Executive Summary)*. Convention Industry Council: Alexandria VA. Retrieved from: http://www.ficpnet.com/sites/default/files/CIC%20Meetings%20ESS%20Update%20Executive%20Summary%20FINAL%20FINAL.pdf

Corvino, J. (2014). The fact/opinion distinction. *The Philosophers' Magazine*, 65, 57-61. doi: 10.5840/tpm20146550

CPD Standards Office. (2018). *CPD Across the Globe*. London: The Professional Development Consortium Ltd. Retrieved from: https://www.cpdstandards.com/wp-content/uploads/2015/04/Factsheet-CPD-Across-the-Globe.pdf

Creswell, J. W. (2008). Educational research: Planning, conducting, and evaluating quantitative and qualitative research. Upper Saddle River, NJ: Pearson/Merrill Education.

Creswell, J. (2009). Research Design: Qualitative, Quantitative, and Mixed Methods Approaches (3rd Ed.). London: SAGE.

Creswell, J. W., & Garrett, A. L. (2008). The "movement" of mixed methods research and the role of educators. *South African Journal of Education*, *28*(3), 321-333.

CSIC [Consejo Superior de Investigaciones Científicas]. (2015). *Webometrics Ranking of World Universities*. Available at: http://www.webometrics.info/en/About_Us (Accessed 12.08.2018)

CSIC [*Consejo Superior de Investigaciones Científicas*]. (2018). *Webometrics Ranking of World Universities*. Available at: http://www.webometrics.info/en/node/54 (Accessed 03.10.2018)

D'Angelo, L. (2011). Academic posters across disciplines: a preliminary study. *Language Studies Working Papers*, 3, 15-28.

Davenport, T. H., & Prusak, L. (1998). *Working knowledge: How organizations manage what they know*. Boston, MA: Harvard Business Press.

de Hédouville. (1665). *Le Journal des Savans*. Paris: Jean Cusson.

De Leo, G., LeRouge, C., Ceriani, C., & Niederman, F. (2006). Websites most frequently used by physician for gathering medical information. In AMIA Annual Symposium Proceedings (Vol. 2006, p. 902). American Medical Informatics Association.

de Vries, B., & Pieters, J. M. (2007). Knowledge sharing at conferences. Educational Research and Evaluation, *13*(3), 237-249. doi: 10.1080/13803610701626168

Denard Goldman, K., & Jahn Schmalz, K. (2010). Cultivating Conference Confidence: Getting the Most Out of Attending Professional Meetings. *Health Promotion Practice, 11*(2), 157-160. doi: 10.1177%2F1524839909357318

Denscombe, M. (2008). Communities of practice: A research paradigm for the mixed methods approach. *Journal of Mixed Methods Research*, *2*(3), 270-283. doi: 10.1177/1558689808316807

Department for Education. (2016a). *Standard for teachers' professional development*. London: DoE. Retrieved from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/ attachment_data/file/537030/160712_-_PD_standard.pdf

Department for Education. (2016b). *Standard for teachers' professional development: Implementation guidance for school leaders, teachers, and organisations that offer professional development for teachers*. London: DoE. Retrieved from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/537030/160712_-_PD_standard.pdf

DiMaggio, P. (1997). Culture and cognition. *Annual Review of Sociology*, *23*(1), 263-287. doi: 10.1146/annurev.soc.23.1.263

Dolowitz, D., & Marsh, D. (1996). Who learns what from whom: a review of the policy transfer literature. *Political Studies*, *44*(2), 343-357. doi: 10.1111/j.1467-9248.1996.tb00334.x

Dossett, L. A., Fox, E. E., del Junco, D. J., Zaydfudim, V., Kauffmann, R., Shelton, J., et al. (2012). Don't forget the posters! Quality and content variables associated with accepted abstracts at a national trauma meeting. *J Trauma Acute Care Surg*, *72*(5), 1429-1434. doi: 10.1097/TA.0b013e3182479c9b

Duchin, S., & Sherwood, G. (1990). Posters as an educational strategy. *J Continuing Education in Nursing*, *21*(5), 205-208. doi: 10.3928/0022-0124-19900901-06

Ebner, M., Mühlburger, H., Schaffert, S., Schiefner, M., Reinhardt, W., & Wheeler, S. (2010). Getting granular on twitter: tweets from a conference and their limited usefulness for non-participants. In: *Key competencies in the knowledge Society* (pp. 102-113). Berlin, Heidelberg: Springer.

EC [European Commission]. (2015). *CO2 time series 1990-2013 per capita for world countries*. EDGAR – Emissions Database for Global Atmospheric Research. Retrieved from: http://edgar.jrc.ec.europa.eu/overview.php?v=CO2ts_pc1990-2013 (Accessed 16.09.2017)

Eckert, P. (2006). Communities of practice. In: K. Brown [Ed.], *Encyclopedia of Language and Linguistics* (2nd Ed) (pp. 683-685), New York: Elsevier Science.

Edwards, D., Foley, C., & Malone, C. (2017). *The Power of Conferences*. Sydney: UTS ePress.

Eisenschitz T, Knox J, Oppenheim C, Richards K, & Wittels P. (1979). Poster sessions as a medium of scientific communication. *Journal of Research Communication Studies*, *1*(3):235-242.

Elliott, F. (1937). Attention effects from poster, radio and poster- radio advertising of an exhibit. *Journal of Applied Psychology*, *21*, 365-371. doi. 10.1037/h0061576

Elo, S., & Kyngäs, H. (2008). The qualitative content analysis process. *Journal of Advanced Nursing*, *62*(1), 107-115. doi: 10.1111/j.1365-2648.2007.04569.x

Ernster, L., & Whelan, W. (1984). Short reports: a new format for disseminating information from scientific meetings. *European Journal of Biochemistry*, *114*(3), 423-424.

Etter, J-F. & Laszlo, E. (2005). Evaluation of a poster campaign against passive smoking for World No-Tobacco Day. *Patient Education & Counseling*, *57*(2), 190-198.

European Society of Cardiology. (2018). *ESC Congress 2018*. 25-29 August, Munich, Germany. Retrieved from: https://www.escardio.org/portal/site/Escardio/menuitem.c9f480f01a3ca18798f54de7202031ca/?vgnextoid=3f7fec3be124d410VgnVCM1000004e03a8c0RCRD&vgnextchannel=34d1d0ce97cbc410VgnVCM1000004e03a8c0RCRD&vgnextfmt=default&vgnextlocale=EN (Accessed 15.07.2018)

Eventbrite. (2017). *Event Industry Report 2017*. London: Eventbrite. Retrieved from: https://www.eventbrite.co.uk/blog/academy/event-industry-statistics-pulse-report-2017/

Events Industry Council. (2018). *Economic Significance of Meetings to the US Economy*. New York: Oxford Economics. Retrieved from: http://www.eventscouncil.org/ResearchInfo/Economic-Significance-of-Meetings (Accessed 11.08.2018)

Facebook. (2018). *Mission statement*. Retrieved from: https://www.facebook.com/pg/facebook/about/?ref=page_internal (Accessed 29.07.2018)

Fan, W., & Yan, Z. (2010). Factors affecting response rates of the web survey: A systematic review. *Computers in Human Behavior*, *26*(2), 132-139. doi: 10.1016/j.chb.2009.10.015

Federation of European Biochemical Societies. (1969). Free Communications – Demonstration Session: Carbohydrate Metabolism. In: *6th FEBS Meeting*, 7-11 April 1 (p.16), Madrid, Spain.

Finnish Publication Forum (*Julkaisufoorumi*). (2017). *Conferences removed from the database.* Available at: http://www.julkaisufoorumi.fi/fi/arkisto/tiedotteet/conferences-removed-database. (Accessed 15.07.2018)

Finnish Publication Forum (*Julkaisufoorumi*). (2018). Publication channel search. Available at: https://www.tsv.fi/julkaisufoorumi/haku.php. (Accessed 15.07.2018)

Fjordback Søndergaard, T., Andersen, J., & Hjørland, B. (2003). Documents and the communication of scientific and scholarly information: Revising and updating the UNISIST model. *Journal of Documentation*, *59*(3), 278-320. doi: 10.1108/00220410310472509

Flick, U., von Kardoff, E., & Steinke, I. (Eds.). (2004). *A companion to qualitative research*. London: SAGE.

Fowles, E. (1992). Poster Presentations as a Strategy for Evaluating Nursing Students in a Research Course. *Journal of Nursing Education*, *31*(6), 287. doi: 10.3928/0148-4834-19920601-13

GAI [Global Academic Institute]. (2018). *8 Reasons to attend international academic conferences*. Global Academic Institute. Retrieved from: http://www.globalacademicinstitute.com/8-reasons-to-attend-international-academic-conferences/

GDC [General Dental Council]. (2013). *Continuing Professional Development for dental professionals.* London: General Dental Council. Retrieved from: https://www.gdc-uk.org/professionals/cpd/requirements

Gibson, J. J. (1979). *The ecological approach to visual perception*. Boston: Houghton Mifflin.

Glasziou, P., & Haynes, B. (2005). The paths from research to improved health outcome. *Evidence-Based Nursing*, *8*(2), 36–38. doi: 10.1136/ebn.8.2.36

GMC [General Medical Council]. (2012). *Continuing professional development: guidance for all doctors*. London: General Medical Council. Retrieved from: https://www.gmc-uk.org/-/media/documents/cpd-guidance-for-all-doctors-0316_pdf-56438625.pdf

Goodhand, J., Giles, C., Wahed, M., Irving, P., Langmeadm L., & Rampton, D. (2011). Poster presentations at medical conferences: an effective way of disseminating research? *Clinical Medicine*, *11*(2), 138-141. doi: 10.7861/clinmedicine.11-2-138.

Google Scholar. (2018). Metrics: Top Publications. Retrieved from: https://scholar.google.co.uk/citations?view_op=top_venues&hl=en (Accessed 04.08.2018)

Gordon, M., Darbyshire, D., Saifuddin, A., & Vimalesvaran, K. (2013). Limitations of poster presentations reporting educational innovations at a major international medical education conference. *Medical Education Online*, 18. doi: 10.3402/meo.v18i0.20498.

Gracyalny, M. (2017). Scales, Likert Statement. In: M. Allen [Ed.]. *The SAGE Encyclopedia of Communication Research Methods* (pp. 1557). Thousand Oaks, CA: SAGE.

Graham, I. D., Logan, J., Harrison, M. B., Straus, S. E., Tetroe, J., Caswell, W., & Robinson, N. (2006). Lost in knowledge translation: time for a map?. *Journal of Continuing Education in the Health Professions*, *26*(1), 13-24. doi: 10.1002/chp.47

Grant, M. J. & Booth, A. (2009). A typology of reviews: an analysis of 14 review types and associated methodologies. *Health Information & Libraries Journal*, *26*(2), 91-108. doi: 10.1111/j.1471-1842.2009.00848.x

Grant, Y. N. & Weaver, P. A. (1996). The meeting selection process: A demographic profile of attendees clustered by criteria utilized in selecting meetings. *Journal of Hospitality & Tourism Research*, *20*(1): 57-71. doi: 10.1177/109634809602000106

Grant, Y. N. (1994a). Factors that contribute to the selection process of meetings from the perspective of the attendee. Annual CHRIE Conference July 27-30, 1994 Palm Springs California.

Grant, Y. N. (1994b). Factors that contribute to the selection process of meetings from the perspective of the attendee. (Doctoral dissertation, Virginia Tech).

Gross, N., & Fleming, C. (2011). Academic conferences and the making of philosophical knowledge. In: C. Camic, N. Gross, & M. Lamont [Eds.], *Social Knowledge in the Making* (pp.151-179). Chicago: University of Chicago Press.

Grosseck, G., & Holotescu, C. (2008). Can we use Twitter for educational activities. *In 4th international scientific conference, eLearning and software for education*, April 17-18, Bucharest, Romania.

Gunawardena, C. N. (1995). Social presence theory and implications for interaction and collaborative learning in computer conferences. *International Journal of Educational Telecommunications*, *1*(2), 147-166.

Ha, T. H., Yoon, D. Y., Goo, D. H., Chang, S. K., Seo, Y. L., Yun, E. J., et al. (2008). Publication rates for abstracts presented by Korean investigators at major radiology meetings. *Korean J Radiol*, *9*(4), 303-11. doi: 10.3348/kjr.2008.9.4.303

Haidet, P., Morgan, R. O., O'Malley, K., Moran, B. J., & Richards, B. F. (2004). A controlled trial of active versus passive learning strategies in a large group setting. *Advances in Health Sciences Education 9*(1), 15-27. doi: 10.1023/B:AHSE.0000

Handron, D. S. (1994). Poster Presentations - A Tool for Evaluating Nursing Students. *Nurse Educ*, *19*(1), 17-19.

Hardy, B., Doughty, S., Parretti, M., Tennison, J., Finn, B., & Gardner, K. (1997). Internet conferences in NMR spectroscopy. *Prog Nucl Magn Reson Spectrosc 31*(2):107–117. doi. 10.1016/S0079-6565(97)00009-5

Harrison, J., MacGibbon, L., & Morton, M. (2001). Regimes of trustworthiness in qualitative research: The rigors of reciprocity. *Qualitative Inquiry*, *7*(3), 323-345. doi: 10.1177/107780040100700305

Hart, C. (2018). *Doing a Literature Review: Releasing the Research Imagination*. Los Angeles: SAGE.

Harte, R. A. (1974). Poster sessions - a better way to communicate. In: *Federation Proceedings, 33*(10), pp. 2087-2088. Bethesda, MD: Federation of American Societies for Experimental Biology.

Harvard Library. (2018). Major Databases for Medical Education Research [online]. Retrieved from: https://guides.library.harvard.edu/c.php?g=310623&p=2072427

HCPC [Health & Care Professions Council]. (2018). *Standards of continuing professional development*. Retrieved from: https://www.hcpc-uk.org/aboutregistration/standards/cpd/

Henry, N. L. (1974). Knowledge management: a new concern for public administration. Public Administration Review, 189-196. doi: 10.2307/974902

Heredia, R. C. (2016). Renegotiating the Terms of Discourse: Interrogating the Academy. *Economic & Political Weekly, 51*(34), 19.

Hertrampf, K., Wenz, H. J., Koller, M., Grund, S. & Wiltfang, J. (2011). The oral cancer knowledge of dentists in Northern Germany after educational intervention. *European Journal of Cancer Prevention*, *20*(5), 431-437.

Hessels, L. K., & Van Lente, H. (2008). Re-thinking new knowledge production: A literature review and a research agenda. *Research Policy*, *37*(4), 740-760. doi: 10.1016/j.respol.2008.01.008

Hickson, M. (2006). Raising the Question #4: Why Bother Attending Conferences? *Communication Education*, *55*(4), 464-468. doi: 10.1080/03634520600917632

Hill, P. (2001). How can conferences and study days benefit practice?. *Nursing Times*, *97*(9): 9

Høyer Leivestad, H., & Nyqvist, A. (2017). *Ethnographies of Conferences and Trade Fairs: shaping industries, creating professionals*. Basingstoke: Palgrave Macmillan.

Høyer, K. G., & Næss, P. (2001). Conference tourism: a problem for the environment, as well as for research*? Journal of Sustainable Tourism, 9*(6), 451-470. doi: 10.1080/09669580108667414

Hoyt, J., & Whyte, C. (2011). Increasing the quality and value of conferences, seminars, and workshops. *The Journal of Continuing Higher Education*, *59*(2), 97–103. doi:10.1080/07377363.2011.568828.

Huang, Q., Davison, R. M., & Gu, J. (2008). Impact of personal and cultural factors on knowledge sharing in China. *Asia Pacific Journal of Management*, *25*(3), 451-471.

Hull, E. (2017). Conducting Research in Your Own Backyard. *Teaching and Learning in Nursing*, *12*(4), 232-233. doi: 10.1016/j.teln.2017.06.011

Hurd, J. M. (2000). The transformation of scientific communication: A model for 2020. *Journal of the American Society for Information Science*, *51*(14), pp. 1279-1283. doi: 10.1002/1097-4571(2000)9999:9999<::AID-ASI1044>3.0.CO;2-1

Hutchinson, J. (2016). How Average Hotel Room Prices Rank Up Around The UK. *Mail Online 13, March 2016*. Retrieved from: http://www.dailymail.co.uk/travel/travel_news/article-

IAPCO [International Association of Professional Congress Organizers]. (1992). *Meeting Industry Terminology*. Luxembourg: Commission of the European Communities. Available from: https://publications.europa.eu/en/publication-detail/-/publication/aef68ffe-4079-459a-b5e3-312e0bb981a8/language-en

ICCA [International Congress and Convention Association]. (2014). *The international association meetings market 2004-2013*. Retrieved from: http://www.iccaworld.com/newsarchives/archivedetails.cfm?id=4255

IEREK. (2018). 6 Important Reasons you should attend international conferences [online]. Retrieved from: http://www.ierek.com/news/index.php/2017/01/08/reasons-attend-international-conferences/

Illich, I., Zola, I. K., McKnight, J., Caplan, M., & Shaiken, H. (1977). *Disabling Professions (Ideas in Progress)*. London: Marion Boyars.

Imperial College. (2018). Poster Presentations. Graduate School: Imperial College, London. Retrieved from: https://www.imperial.ac.uk/media/imperial-college/study/graduate-school/public/helpsheets/Poster-presentation-handout---October-2017.pdf (Accessed 14.08.2018).

James, P. (2006). *Globalism, Nationalism, Tribalism: Bringing Theory Back In* (Volume 2 of Towards a Theory of Abstract Community). London: SAGE.

Johnson, R., Watkinson, A., & Mabe, M. (2018). *The STM report: An overview of scientific and scholarly journal publishing (5th ed.)*. International Association of Scientific, Technical and Medical Publishers, The Hague. Retrieved from https://www.stm-assoc.org/2018_10_04_STM_Report_2018.pdf

Jung, G. W., Senthilselvan, A. & Salopek, T. G. (2010). Ineffectiveness of sun awareness posters in dermatology clinics. *Journal of the European Academy of Dermatology & Venereology*, *24*(6), 697-703.

Kanazawa, S. (2008). Common misconception about science I: "scientific proof". *Psychology Today*. Online: Sussex Publishers, LLC. Retrieved from: https://www.psychologytoday.com/blog/the-scientific-fundamentalist/200811/common-misconceptions-about-science-i-scientific-proof

Kawahara, T., Iwatate, T., Inoue, K., Hayashi, S., Yoshimoto, H., & Takanashi, K. (2016). Multi-modal sensing and analysis of poster conversations with smart posterboard. *APSIPA Transactions on Signal and Information Processing*, *5*(e2), 1-12. doi: 10.1017/ATSIP.2016.2

Kelley, K., Clark, B., Brown, V., & Sitzia, J. (2003). Good practice in the conduct and reporting of survey research. *International Journal for Quality in Health Care*, *15*(3), 261-266. doi: 10.1093/intqhc/mzg03l

Kim S., Lee J. S., & Kim M. (2011). How different are first-time attendees from repeat attendees in convention evaluation? *International Journal of Hospitality Management*, *31*(2), 544-553. doi: 10.1016/j.ijhm.2011.07.014

Kim, Y. J. (2014). Why Every Science Student Should Attend a Conference. PLOS ECR Community [online]. Retrieved from: http://blogs.plos.org/thestudentblog/2014/02/24/every-science-student-should-attend-conference/

Kimmons, R., & Veletsianos, G. (2016). Education scholars' evolving uses of twitter as a conference backchannel and social commentary platform. *British Journal of Educational Technology*, *47*(3), 445-464. doi: 10.1111/bjet.12428

Kinikin, J., & Hench, K. (2012). Poster presentations as an assessment tool in a third/college-level Information Literacy course: an effective method of measuring student understanding of library research skills. *Journal of Information Literacy*, *6*(2), 86-96. doi: 10.11645/6.2.1698

Kordts-Freudinger, R., Al-Kabbani, D., & Schaper, N. (2017). Learning and interaction at a conference. *New Horizons in Adult Education and Human Resource Development*, *29*(1), 29-38. doi: 10.1002/nha3.20169

KTH Royal Institute of Technology. (2015). Which journals and conference proceedings are covered by Web of Science and Scopus? Retrieved from: https://www.kth.se/en/kthb/publicering/bibliometri/guides-and-faq/faq-bibliometrics/which-journals-and-conference-proceedings-are-covered-by-web-of-science-and-scopus-1.546260

Lather, P. (1991). *Getting smart: Feminist research and pedagogy with/in the postmodern*. New York: Routledge.

Lee, J. S., & Min, C. K. (2013a). Examining the role of multidimensional value in convention attendee behavior. *Journal of Hospitality & Tourism Research*, *37*(3), 402-425. doi: 10.1177/1096348012436383

Lee, J. S., & Min, C. K. (2013b). Prioritizing convention quality attributes from the perspective of three-factor theory: The case of academic association convention. *International Journal of Hospitality Management*, 35, 282-293. doi: 10.1016/j.ijhm.2013.07.003

Leech, N. L., & Onwuegbuzie, A. J. (2009). A typology of mixed methods research designs. *Quality & Quantity*, *43*(2), 265-275. doi: 10.1007/s11135-007-9105-3

Levitin, D. (2017). Weaponised Lies: how to think critically in the post-truth era. New York: Penguin Random House.

Lieger, O., Graf, C., El-Maaytah, M. & Von Arx, T. (2009). Impact of educational posters on the lay knowledge of school teachers regarding emergency management of dental injuries. *Dental Traumatology*, *25*(4), 406-412.

Lindsay, E. (2018). Importance of attending conferences: being aware of what is happening around you. *British Journal of Community Nursing*, *23*(6), 40-41. doi: 10.12968/bjcn.2018.23.Sup6.S40

LinkedIn. (2018). About LinkedIn. Retrieved from: https://about.linkedin.com/ (Accessed 29.07.2018)

Lohri-Posey, B. S. (1999). Bringing nursing theory to life: the poster presentation. *Nurse Educ.* , *24*(1), 6.

MacIntosh-Murray, A. (2007). Poster presentations as a genre in knowledge communication: a case study of forms, norms, and values. *Science Communication, 28*(3), 347-376. doi: 10.1177/1075547006298251

Madian, K. & Lee, G. C. (2014). The number of scholarly documents on the public web. *PLoS One*, *9*(5), e93949. doi: 10.1371/journal.pone.0093949

Mair, J. (2010). Profiling Conference Delegates Using Attendance Motivations. *Journal of Convention & Event Tourism, 11*(3): 176-194. doi: 10.1080/15470148.2010.502032

Maugh, T. H. (1974). Speaking of science: poster sessions: a new look at scientific meetings. *Science*, 184:1361

McCarthy, J. F., McDonald, D. W., Soroczak, S., Nguyen, D. H., & Rashid, A. M. (2004). Augmenting the social space of an academic conference. In: Proceedings of the 2004 ACM conference on Computer supported cooperative work (pp. 39-48). ACM.

McKendrick, D. R., Cumming, G. P., & Lee, A. J. (2012). Increased use of Twitter at a medical conference: a report and a review of the educational opportunities. *Journal of medical Internet research, 14*(6), e176. doi: 10.2196/jmir.2144

Meho, L. I. (2006). E-mail interviewing in qualitative research: A methodological discussion. *Journal of the American Society for Information Science and Technology*, *57*(10): 1284-1295. doi: 10.1002/asi.20416

Meininger, D., Bück, M., Bohlmann, S., Weber, C., Strouhal, U., Ihlow, K., et al. (2011). *Vom winde verweht oder... „Schicksal" wissenschaftlicher beiträge auf großen Anästhesiekongressen–ein update* [Blown by the wind or ... the "fate" of scientific contributions in large anesthesia congresses - an update]. *Anaesthesist*, *60*(2), 118-124. doi: 10.1007/s00101-010-

Ministry of Higher Education and Science [Denmark]. (2018). BFI list of series (dynamic list). Retrieved from: https://ufm.dk/en/research-and-innovation/statistics-and-analyses/bibliometric-research-indicator/bfi-lists

Meuser, M., & Nagel, U. (2009). The expert interview and changes in knowledge production. In: A. Bogner, B. Littig, & W. Menz [Eds.], *Interviewing Experts* (pp. 17-42). London: Palgrave Macmillan.

Mongeon, P., & Paul-Hus, A. (2016). The journal coverage of Web of Science and Scopus: a comparative analysis. *Scientometrics, 106*(1), 213-228. doi: 10.1007/s11192-015-1765-5

Morgan, D. (2007). Paradigms lost and pragmatism regained: Methodological implications of combining qualitative and quantitative methods. *Journal of Mixed Methods Research*, *1*(1), 48-76. doi: 10.1177/2345678906292462

Moule, P., Judd, M., & Girot, E. (1998). The poster presentation: what value to the teaching and assessment of research in pre-and post-registration nursing courses? *Nurse Educ. Today*, *18*(3), 237-242. doi: 10.1016/S0260-6917(98)80085-3

Murphy, G. L., & Medin, D. L. (1985). The role of theories in conceptual coherence. *Psychological Review*, *92*(3), 289.

Natarajan, R. (2008). On Attending Conferences. *IEEE Computer, 41*(2), 107-108.

Neves, J., Lavis, J. N., & Ranson, M. K. (2012). A scoping review about conference objectives and evaluative practices: how do we get more out of them? *Health Research Policy and Systems*, *10*(1), 26. doi: 10.1186/1478-4505-10-26

Nicolson, D. J. (2017). *Academic Conferences as Neoliberal Commodities*. Basingstoke: Palgrave Macmillan.

Nielsen, K. H. (2013). Scientific communication and the nature of science. *Science & Education*, *22*(9), 2067-2086. doi: 10.1007/s11191-012-9475-3

Niyazov, Y., Vogel, C., Price, R., Lund, B., Judd, D., Akil, A., ... & Shron, M. (2016). Open access meets discoverability: Citations to articles posted to Academia. edu. *PloS ONE*, *11*(2), e0148257. doi: 10.1371/journal.pone.0148257

Nycyk, M. (2018). Academic and scientific poster presentation: a modern comprehensive guide [book review]. *Higher Education Research & Development* [Published online: 30 May 2018], doi: 10.1080/07294360.2018.1477457

OECD. (2018a), Spending on tertiary education (indicator). doi: 10.1787/a3523185-en (Accessed 17.08.2018)

OECD. (2018b). Researchers (indicator). doi: 10.1787/20ddfb0f-en (Accessed 17.08.2018)

Omnipress. (2018). *2018 State of The Conference Industry: Managing an Increasingly Diverse Content Portfolio*. Madison, NY: Omnipress. Retrieved from: https://www.omnipress.com/project/2018-conference-industry-report-expanding-role-conference-content/

Otero-Iglesias, M. (2017). The Great Benefits of Attending Academic Conferences. *UACES*. Retrieved from https://www.uaces.org/resources/the-great-benefits-of-attending-academic-conferences

Paas, F. G., & Van Merriënboer, J. J. (1993). The efficiency of instructional conditions: An approach to combine mental effort and performance measures. Human factors, 35(4), 737-743. doi: 10.1177/001872089303500412

Palin, E. (2017). How to get the most out of attending conferences. *Science*, May 8, 2017. doi:10.1126/science.caredit.a1700037

Parahoo, K. (2014). *Nursing research: principles, process and issues* [3rd Ed]. London: Palgrave Macmillan.

Pearlman, D. (2016). Globalization practices within the US Meetings, Incentives, Conventions, and Exhibitions industry. *Journal of Convention & Event Tourism*, *17* (1), 55-69. doi: 10.1080/15470148.2015.1100569

Peck, C., McCall, M., McLaren, B., Rotem, T. (2000). Continuing medical education and continuing professional development: international comparisons. *BMJ*, 320, 432-435. doi: 10.1136/bmj.320.7232.432

Peirce, C. (1934). *Collected Papers of Charles Sanders Peirce. Vol. 5, Pragmatism and Pragmaticism*, [C. Hartshorne & P. Weiss Eds.], Cambridge. MA: Harvard University Press.

Pereira, M. d. M. (2017). *Power, knowledge and feminist scholarship: An ethnography of Academia*. London: Routledge.

Perfetti, C. (1985). *Reading Ability*. New York: Oxford University Press.

Plass, J. L., Moreno, R., & Brünken, B. (2010). *Cognitive Load Theory*. Cambridge: Cambridge University Press.

Price, B. (2010). Disseminating best practice at conferences. *Nursing Standard*, *24*(25), 35-41.

PWC [PricewaterhouseCoopers]. (2014). *The economic significance of meetings to the US economy. Interim Study Update for 2012 (Executive Summary)*. Convention Industry Council: Alexandria VA. Retrieved from: http://www.ficpnet.com/sites/default/files/CIC%20Meetings%20ESS%20Update%20Executive%20Summary%20FINAL%20FINAL.pdf

Radicchi, F., Fortunato, S., & Castellano, C. (2008). Universality of citation distributions: Toward an objective measure of scientific impact. *Proceedings of the National Academy of Sciences, 105*(45), 17268-17272. doi: 10.1073/pnas.0806977105

RCN [Royal College of Nursing]. (2016). *RCN Factsheet: Continuing Professional Development (CPD) for nurses working in the United Kingdom (UK)*. London: Royal College of Nursing. Retrieved from: https://www.rcn.org.uk/about-us/policy-briefings/pol-1614

ReadingSoft.com. (2016). Typical reading results. Available at: http://www.readingsoft.com/. (Accessed 02.03.2016)

Reba, R. C. (1979). Relative advantages and disadvantages of poster presentations at a scientific meeting. *Journal of Nuclear Medicine*, *20*(6), 582-582.

Reinhardt, W., Ebner, M., Beham, G. & Costa, C. (2009). How People are Using Twitter during Conferences. Creativity and Innovation Competencies on the Web. V. Hornung-Prahauser, M. Luckmann, (Eds.). Proceeding of 5 EduMedia Conference. p.145-146. Salzburg.

ResearchGate. (2018). About us. Retrieved from: https://www.researchgate.net/about (Accessed 29.07.2018)

Riley, N. (1939). Poster "Blueprints". *The Social Studies*, *30*(4), 157-158. doi: 10.1080/00220973.1935.11016377

Rittichainuwat, B. N., Beck, J. A., & Lalopa, J. (2001). Understanding motivations, inhibitors, and facilitators of association members in attending international conferences. *Journal of Convention & Exhibition Management, 3*(3), 45-62. doi: 10.1300/J143v03n03_04

Rogers, T. (2008). *Conferences and Conventions: A Global Industry* (2nd edition). Oxford: Butterworth-Heinemann.

Rothstein, J. M. (1990). Caveat Emptor and Conference Abstracts. *PHYS THER. 70* (5): 277-278. doi: 10.1093/ptj/70.5.277

Rowe, N. & Ilic, D. (2008a). Traditional Academic Posters: a suitable medium for knowledge transfer? In: *Bournemouth University Education Conference: Curriculum 2012*, 19 May, 2008, Bournemouth University, Poole.

Rowe, N. & Ilic, D. (2008b). Traditional academic posters - Transition from the Analogue Age. In: *1st Bergen International Conference: Evidence into Practice - Challenges for Lifelong Learning in Nursing*, 18-20 May 2008, Bergen University, Norway.

Rowe, N. & Ilic, D. (2009a). What impact do posters have on academic knowledge transfer? A pilot survey on author attitudes and experiences. *BMC Medical Education*, December 2009. 9:71* doi: 10.1186/1472-6920-9-71

Rowe, N. & Ilic, D. (2009b). Innovating professional knowledge-transfer: Academic Poster to 'MediaPoster'. *Medical Education*, *43*(5), 496. doi: 10.1111/j.1365-2923.2009.03338.x

Rowe, N. & Ilic, D. (2011). Poster Presentations: a visual medium for academic & scientific meetings. *Journal of Paediatric Respiratory Reviews*, *12*(3), 208-213. doi: 10.1016/J.PRRV.2011.01.011

Rowe, N. (2008). Traditional academic posters: a suitable medium for knowledge transfer? In: *First UCY Research Conference: What's going on at UCY: Research in progress*, 27 May 2008, University Centre Yeovil (UCY), pp. 50-59.

Rowe, N. (2012). Academic & Scientific Poster Presentation - visualising knowledge as a means to facilitate knowledge transfer. In: D. Ilic [Ed.], *Knowledge Transfer: Practices, Types and Challenges*. New York: Nova Science Publishing, (pp. 123-139).

Rowe, N. (2014a). Posters at Academic / Scientific Conferences: meeting the needs of viewers, presenters and society. Poster presented in: *Federation of European Biochemical Societies / European Molecular Biology Organization Joint Conference*, 30 Aug–04 Sept, 2014, Paris, France. Published in: FEBS Journal, 281 (s1), 2014.

Rowe, N. (2014b). Poster Presentations - the 'then and now' of a popular medium of scientific communication. *Federation of European Biochemical Societies - FEBS News*, July 2014, 9–10.

Rowe, N. (2014c). Communication: Help poster sessions to grab attention. *Nature 509, no. 7499*, 164. doi: 10.1038/509164e

Rowe, N. (2015a). Scientific Conferences: should they become an open access activity? *The EuroScientist* [online]. Available from: http://www.euroscientist.com/opening-up-conference-discussions-to-the-virtual-community/. (Accessed 03.08.2018)

Rowe, N. (2015b). A Cinderella story for early career academics. *Times Higher Education*, 11th June 2015, 44-47.

Rowe, N. (2017a). Academic & Scientific Poster Presentation - A Modern Comprehensive Guide. Cham, Switzerland: Springer Nature.

Rowe, N. (2017b). The Value, Scope and Cost of Conferences: looking beyond the Events Industry. In: *Society for Research into Higher Education - Annual Research Conference*, §C1.2 p26, 6–8 December, Newport, Wales UK. Available from https://www.srhe.ac.uk/conference2017/abstracts/0068.pdf

Rowe, N. (2017c). Breaking the Wall of Conference Effectiveness. Presented in: *Falling Walls Lab* – Turku, 15, September 2017. Available from: http://aboagora.fi/falling-walls-lab/falling-walls-lab-turku-2017/

Rowe, N. (2018). Conferences mean high times but low returns. *Times Higher Education*, 12th April 2018, 48-51.

Rowley, J. (2007). The wisdom hierarchy: representations of the DIKW hierarchy. *Journal of Information Science*, *33*(2), 163-180. doi: 10.1177/0165551506070706

Rowley, J., & Hartley, R. (2017). *Organizing Knowledge: an introduction to managing access to information*. London: Routledge.

RSA. (2018). *Continuing Education Credits*. Retrieved from: https://www.rsaconference.com/events/us16/agenda/ce-credits (accessed 30.05.2018).

Salzl, G., Golder, S., Timmer, A., Marienhagen, J., Scholmerich, J., & Grossmann, J. (2008). *Posterausstellungen auf nationalen Fachkongressen-Bereicherung oder Farce?* [Poster exhibitions at national conferences: education or farce?]. *Deutsches Arzteblatt-Arztliche Mitteilungen-Ausgabe*, *105*(5), 78-83. doi: 10.3238/arztebl.2008.0078.

Saunders, M., Lewis, P., and Thornhill, A. (2009). *Research Methods for Business Students* [3rd Ed]. Harlow: Pearson Education.

Saur, K. G. (2006). *World Guide to Scientific Associations and Learned Societies*. München: Die Deutsche Bibliothek.

Scherer, R. W., Langenberg, P., & Von Elm, E. (2008). Full publication of results initially presented in abstracts. *Cochrane Database Syst Rev, 2*(2), 1-78. Retrieved from: https://pdfs.semanticscholar.org/927d/0654e649b0a585b2b52e9f2ce1e18b301efa.pdf

Scherer, R.W., Meerpohl, J.J., Pfeifer, N., Schmucker, C., Schwarzer, G., & von Elm, E. (2018). Full publication of results initially presented in abstracts. Cochrane Database of Systematic Reviews, (11), Art. No.: MR000005. doi. 10.1002/14651858.MR000005.pub4.

Schmidmaier, D. (1981). Poster Sessions as a New Viewpoint of Scientific Communication -General Problems and Library Aspects: Paper 10. In: *Proceedings of the IATUL Conferences*. IATUL Proceedings. Retrieved from: http://docs.lib.purdue.edu/iatul/1981/papers/10

Schneider, A. (2015). Nursing Professional Development: The Value of Nursing Conferences. AMN Healthcare Education Services. Retrieved from: https://www.rn.com/nursing-news/nursing-professional-development-the-value-of-nursing-conferences/

Scotland, J. (2012). Exploring the philosophical underpinnings of research: Relating ontology and epistemology to the methodology and methods of the scientific, interpretive, and critical research paradigms. *English Language Teaching, 5*(9), 9-16. doi: 10.5539/elt.v5n9p9

Severt, D., Wang, Y., Chen, P. J., & Breiter, D. (2007). Examining the motivation, perceived performance, and behavioral intentions of convention attendees: Evidence from a regional conference. *Tourism Management*, *28*(2), 399-408. doi: 10.1016/j.tourman.2006.04.003

Severt, K., Fjelstul, J., & Breiter, D. (2009). A comparison of motivators and inhibitors for association meeting attendance for three generational cohorts. *Journal of Convention & Event Tourism, 10*(2), 105-119. doi: 10.1080/15470140902949695

Shedroff, N. (1999). Information interaction design: A unified field theory of design (pp. 267-292). In: R. Jackson [Ed.]. *Information Design*. Cambridge, MA: MIT Press.

Shenton, A.K. (2004). Strategies for ensuring trustworthiness in qualitative research projects. *Education for information, 22*(2), 63-75. doi: 10.3233/EFI-2004-22201

Shone, A. (2009). *The Business of Conferences*. Oxford: Butterworth Heinemann.

Shridhar, S., Singh, D. P., & Brahmbhatt, K. D. (2010). Conference Networking System Incorporating Social Networking Site Information. U.S. Patent Application No. 12/245,277.

Simon, M. K., & Goes, J. (2011). *Dissertation and scholarly research: Recipes for success*. College Grove, OR: Dissertation Success, LLC.

Society for Neuroscience. (2017). *Neuroscience 2017 meeting – November 11-15*. Retrieved from: https://www.sfn.org/Annual-Meeting/Neuroscience-2017/Sessions-and-Events/Program (Accessed 09.08.2017)

SRA [Solicitors Regulation Authority]. (2016). *Continuing Competence*. Retrieved from: https://www.sra.org.uk/solicitors/cpd/tool-kit/address-learning-development.page

Statista.com. (2018). *Annual change in average global airfares from 2010 to 2018*. Retrieved from: https://www.statista.com/statistics/324783/annual-change-in-average-global-airfares/ (Accessed 19.08.2018)

Stieger, S., & Göritz, A. S. (2006). Using instant messaging for Internet-based interviews. *CyberPsychology & Behavior, 9*(5): 552-559. doi: 10.1089/cpb.2006.9.552

Stuckey, M. & Hoyer, T. (2018). How to make an effective poster. Under Graduate Research Center: UC Davis, California. Retrieved from: https://urc.ucdavis.edu/local_resources/documents/pdf_documents/How_To_Make_an_Effective_Poster2.pdf (Accessed 14.08.18)

Sweller, J. (1988). Cognitive load during problem solving: Effects on learning. *Cognitive science, 12*(2), 257-285. doi: 10.1207/s15516709cog1202_4

Tashakkori, A., & Teddlie, C. (2003). *Handbook of mixed methods in social and behavioral research*. Thousand Oaks, CA: SAGE.

Teddlie, C., & Yu, F. (2007). Mixed methods sampling: A typology with examples. *Journal of Mixed Methods Research*, *1*(1), 77-100.

Thanh, N. C., & Thanh, T. T. (2015). The interconnection between interpretivist paradigm and qualitative methods in education. *American Journal of Educational Science*, *1*(2), 24-27.

The Conference Board. (2018). *When you participate in our peer networking opportunities, you get an education—and you get credit for it*. Retrieved from: https://www.conference-board.org/ceu/ (accessed 30.05.2018).

The Sophist. (2010). 'Fumes from the Spleen' - On Preparing a Scientific Poster. *Paediatric and Perinatal Epidemiology*, *24*(6), 514.

Thomas, P., & Lees-Maffei, G. (2018). The poster session as fusing theory and practice in art and design education: Exhibiting an occluded genre. *Journal of Writing in Creative Practice*, *11*(2), 233-259. doi: 10.1386/jwcp.11.2.233_1

Thurmond, V. A. (2001). The point of triangulation. *Journal of Nursing Scholarship*, *33*(3), 253-258. doi: 10.1111/j.1547-5069.2001.00253.x

Timmermans, S. & Tavory, I. (2012). Theory Construction in Qualitative Research: From Grounded Theory to Abductive Analysis. *Sociological Theory*, 30(3), 167-186. doi: 10.1177/0735275112457914

Tomaszewski, R., & MacDonald, K. I. (2009). Identifying subject-specific conferences as professional development opportunities for the academic librarian. *The Journal of Academic Librarianship*, *35*(6), 583-590. doi: 10.1016/j.acalib.2009.08.006

Tongco, M. D. C. (2007). Purposive sampling as a tool for informant selection. *Ethnobotany and Research Applications* [online], 5, 147-158. Retrieved from: http://hdl.handle.net/10125/227

UIA [Union of International Associations]. (2018). *The Yearbook of International Organizations*. Available from https://uia.org/yearbook?qt-yb_intl_orgs=3#yearbook_pages-page_yb_faq-0 (Accessed 03.10.2018)

UKCAMS. (2016). *UKCAMS Conference and Meeting Survey (2016)*. RJS Associates Ltd and Tony Rogers Conference & Event Services: Solihull. Retrieved from: http://ukcams.org.uk/published%20ukcams%20reports/index.html

UNESCO [United Nations Educational, Scientific and Cultural Organization]. (1963). *Scientific conference papers & proceedings: contents, influence, value, availability*. Paris: UNESCO Publishing. Retrieved from: http://unesdoc.unesco.org/images/0002/000202/020249eo.pdf (Accessed 12.02.2017)

UNESCO [United Nations Educational, Scientific and Cultural Organization]. (2015). *UNESCO Science Report: towards 2030*. Paris: UNESCO Publishing. Retrieved from http://unesdoc.unesco.org/images/0023/002354/235406e.pdf (Accessed 17.09.2018)

United Nations. (2017). *National Accounts Main Aggregates Database: § GDP and its breakdown at current prices in US Dollars*. Retrieved from https://unstats.un.org/unsd/snaama/dnlList.asp (Accessed 27.12.2018)

University of Cambridge. (2018). *Databases for literature searching* [online]. Retrieved from: https://library.medschl.cam.ac.uk/research-support/databases/

University of Leicester. (2018). Designing an academic poster. Retrieved from: https://www2.le.ac.uk/offices/ld/resources/presentations/designing-poster/poster (Accessed 14.08.18)

van Hulst, M. & Yanow, D. (2016). From Policy "Frames" to "Framing" Theorizing a More Dynamic, Political Approach. *The American Review of Public Administration*, *46*(1), 92-112. doi: 10.1177/0275074014533142

Vargo, S. L., Maglio, P. P., & Akaka, M. A. (2008). On value and value co-creation: A service systems and service logic perspective. *European Management Journal*, *26*(3), 145-152. doi: 10.1016/j.emj.2008.04.003

Vaughan, L., Tang, J., & Yang, R. (2017). Investigating disciplinary differences in the relationships between citations and downloads. *Scientometrics, 111*(3), 1533-1545. doi: 10.1007/s11192-017-2308-z

Vessey, J. A. & DeMarco, R. F. (2008). The undergraduate research fellows program: a unique model to promote engagement in research. *Journal of Professional Nursing*, *24*(6), 358-363. doi: 10.1016/j.profnurs.2008.06.003

Wang, Y., Ning, J., & Zheng, Y. (2014). Transformation and influencing factors of scholarly communication based on knowledge transfer: A case study of science and technology literature. *Chinese Journal of Data and Information Science*, *7*(3), 45-63.

Ware, M., & Mabe, M. (2015). *An overview of scientific and scholarly journal publishing. The STM report*. The Hague: STM: International Association of Scientific, Technical and Medical Publishers.

Wenger, E. (2009). Communities of practice. *Communities*, 22, 57-62.

Wharrad, H. J., Allcock, N., & Meal, A. G. (1995). The use of posters in the teaching of biological sciences on an undergraduate nursing course. *Nurse Educ. Today*, *15*(5), 370-374. doi: 10.1016/S0260-6917(95)80011-5

Wildgaard, L. E., & Lund, H. (2016). Using eye tracking to develop key indicators in national evaluation: report of the pilot test at STI2016, Valencia. In: *Nordic Workshop on Bibliometrics and Research Policy*. Copenhagen.

Willis, J. W. (2007). *Foundations of qualitative research: interpretive and critical approaches*. London: SAGE.

Wisdom, J., & Creswell, J. W. (2013). *Mixed methods: integrating quantitative and qualitative data collection and analysis while studying patient-centered medical home models*. Rockville: Agency for Healthcare Research and Quality.

Withers, N. (2012). Editorial: In Praise of Posters. *Nature Chemistry*, 4, 67. doi: 10.1038/nchem.1266

Wong, K-L., Ong, S-F., Kuek, T-Y. (2012). Constructing a survey questionnaire to collect data on service quality of business academics. *European Journal of Social Sciences*, *29*(2), 209.221.

Yoo, J. J. E., & Chon, K. (2008). Factors affecting convention participation decision-making: Developing a measurement scale. *Journal of Travel Research*, *47*(1), 113-122. doi: 10.1177/0047287507312421

Zarnetske, J. P., & Zarnetske, P. L. (2015). Strategies for creating a conspicuous, effective, and memorable poster presentation. *GSA Today*, *25*(5), 66-68. doi: 10.1130/GSATG228GW.1

Zeleny, M. (1987). Management support systems: Towards integrated knowledge management. *Human Systems Management*, *7*(1), 59-70. doi: 10.3233/HSM-1987-7108

Zikmund, W. G. (2003). *Business Research Methods* [7th Ed.]. Ohio: South-Western.

Appendix 1. Author Contributions of the Published Articles

Sub-Study I

Ilic, D., Rowe, N. (2013). What is the evidence that poster presentations are effective in promoting knowledge transfer? A state of the art review. *Health Information and Libraries Journal*, 30(1), 4-12. doi: 10.1111/hir.12015

Contributions: DI/NR conceived the work. DI designed the study approach. DI/NR acquired, analysed and interpreted the data. DI/NR drafted and critically revised the work for important intellectual content, and approved the final published version. DI was the corresponding author, and both authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Sub-Study II

Rowe, N. (2013). Tracing the 'grey literature' of poster presentations: a mapping review. *Health Information and Libraries Journal*, 34(2), 106-124. doi: 10.1111/hir.12177

Contributions: NR conceived the work and designed the study approach. NR acquired, analysed and interpreted the data. NR drafted and critically revised the work for important intellectual content, and approved the final published version. NR was the corresponding author, and agrees to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Sub-Study III

Rowe, N., Ilic, D. (2015). Rethinking poster presentations at large-scale scientific meetings: is it time for the format to evolve? *FEBS Journal*, 282(19), 3661-3668. doi: 10.1111/febs.13383

Contributions: NR conceived the work and designed the study approach. NR acquired and analysed the data. NR/DI interpreted the data. NR/DI drafted and critically revised the work for important intellectual content, and approved the final published version. NR was the corresponding author, and both authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Sub-Study IV

Rowe, N. (2018). 'When you get what you want, but not what you need': the motivations, affordances and shortcomings of attending academic/scientific conferences. *International Journal of Research in Education and Science*, 4(2), 714-729. doi:10.21890/ijres.438394

Contributions: NR conceived the work and designed the study approach. NR arranged and conducted the interviews, and acquired, analysed and interpreted the data. NR drafted and critically revised the work for important intellectual content, and approved the final published version. NR was the corresponding author, and agrees to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Co-author note: Professor Dragan Ilic [BSc, GDipRepSci, MRepSci, PhD, GCHPE] is head of the Medical Education Research and Quality unit at the School of Public Health and Preventive Medicine, Monash University, Australia.

Appendix 2. Publication Channel search for 'conference': Finnish Publication Forum (*Julkaisufoorumi*) 2018. (Accessed 15.07.18)

Finnish Publication Forum channel search: 'Conference'		
	Total	**Web of Science**: 'Education & Educational Research' + **Scopus**: 'Education'
Returns	416	197
	Level 0: 194 Level 1 (basic): 219 Level 2 (leading): nil Level 3 (top): nil Ungraded: 3	Wide range of education journals (level 0-3), none specific to conference practices, scientific communication or learning.
Identified as 'conference (etc.) specific'	All	Nil
Conference proceedings / reports	410	
Conference studies (identifying as a sub-discipline area or collating conference studies in a particular field)	Conferences in Research & Practice In Information Technology (0) International Academic Conference Proceedings (0) International Business & Education Conferences Proceedings (0) Matec Web of Conferences E3s Web of Conferences (1) Epj Web of Conferences (1) No publications looking at conferences as a specific study area	No publications looking at conferences as an educational study area
'MICE' industry journals **Tourism research**	Journal Of Convention & Event Tourism (1) Event Management (1) International Journal Of Event And Festival Management (0) International Journal Of Event Management Research (1) International Journal Of Hospitality And Event Management (0) Journal Of Policy Research In Tourism, Leisure & Events (1) Advances In Hospitality & Tourism Research (0) International Journal Of Knowledge Management In Tourism & Hospitality (1) Tourism, Culture & Communication (1) Export list - 100: Level 0: 39 Level 1 (basic): 57 Level 2 (leading): 2 Level 3 (top): 1 Ungraded: 1	

Appendix 3. Conference information capacity by event size/ presentation rate/time

Abstract Reading Capacity
Time needed to read available abstracts (in non-stop hours)
< 1 working day (8h) > 1 working week (40h)
250 word abstracts
Average reader (250 ewpm / 15,000 ewph)

Event size (delegates)	50%	60%	70%	80%
20,000	166.6	200	232	266 (6.65 weeks)
15,000	124.9	150	174	199.5
10,000	83.3	100	116	133
5000	41.6	50	58	66.5
4000	32.2	40	46.4	53.2
3000	24.9	30	34.8	39.9
2000	16.6	20	23.2	26.6
1000	8.3	10	11.6	13.3
500	4.1	5	5.8	6.65
200	1.4	2	2.32	2.66
100	0.8	1.0	1.16	1.33
	Presentation rate			

Abstract Reading Capacity
Time needed to read available abstracts (in non-stop hours)
< 1 working day (8h) > 1 working week (40h)
250 word abstracts
Good reader (500 ewpm / 30,000 ewph)

Event size (delegates)	50%	60%	70%	80%
20,000	83.3	100	116	132 (3.3 weeks)
15,000	62.45	75	87	99
10,000	41.65	50	58	66
5000	20.8	25	29	33
4000	16.1	20	23.2	26.4
3000	12.45	15	17.4	19.9
2000	8.3	10	11.6	13.2
1000	4.15	5	5.8	6.6
500	2.08	2.5	2.9	3.3
200	0.8	1	1.16	1.3
100	0.4	0.5	0.58	0.66
	Presentation rate			

500 word abstracts
Average reader (250 ewpm / 15,000 ewph)

Event size (delegates)	50%	60%	70%	80%
20,000	333.2	400	464	532 (13.3 weeks)
15,000	249.8	300	348	399
10,000	166.6	200	232	266
5000	83.2	100	116	133
4000	64.4	80	92.9	106.4
3000	49.8	60	69.6	79.8
2000	33.2	40	46.4	53.2
1000	16.6	20	23.2	26.6
500	8.2	10	11.6	13.3
200	2.8	4	4.64	5.32
100	1.6	2.0	2.32	2.66
	Presentation rate			

500 word abstracts
Good reader (500 ewpm / 30,000 ewph)

Event size (delegates)	50%	60%	70%	80%
20,000	166.6	200	232	266 (6.65 weeks)
15,000	124.9	150	174	199.5
10,000	83.3	100	116	133
5000	41.6	50	58	66.5
4000	32.2	40	46.4	53.2
3000	24.9	30	34.8	39.9
2000	16.6	20	23.2	26.6
1000	8.3	10	11.6	13.3
500	4.1	5	5.8	6.65
200	1.4	2	2.32	2.66
100	0.8	1.0	1.16	1.33
	Presentation rate			

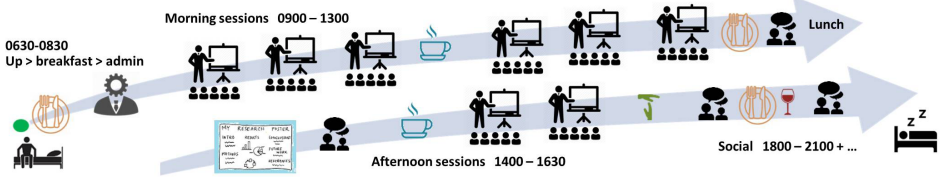
Time to scan titles only for interest (15 words)

Presentations	Average reader	Good reader
5000	5 hours	2.5 hours
2000	2 hours	1 hour
1000	60 minutes	30 minutes
500	30 minutes	15 minutes
200	12.0 minutes	6.0 minutes
100	6.0 minutes	3.0 minutes
50	3.0 minutes	1.5 minutes

- Only at smaller events could the abstracts presented be read in 1 working day.
- Less than 1% of adult readers are 'excellent' readers (800+ ewpm).
- Reading in a foreign language and reading from a screen both impede reading rate.
- At larger events, even scanning titles for interest is time consuming.

- **In a 2 hour poster session**, if 6 minutes is allocated to locate, view and discuss a poster, only 20 posters could be visited: 50 posters on display = 40% / 100 = 20% / 200 = 10% / 500 = 4%

- **There are only so many hours in the day:**



Appendix 4. Poster Perception – Presenters & Viewers Survey: Paris 2014

Academic & Scientific Poster Survey

Participant Information

I would like to invite you to take part in this research study. Before you decide, I would like you to understand what the research is about and what it would involve. Feel free to talk to others about the study if you wish and you may ask me any questions you may have. I may be contacted during each of the Poster Sessions during the conference, or via :

Name: ***Nicholas Rowe***

Email: *xxxxxxxx (redacted)*

Telephone Number: *xxxxxxxx (redacted)*

Purpose of the research
The purpose of this study is to explore participant's views, understanding and practices of Academic & Scientific Poster Presentation. The data from this study will be useful in its own right, and will look to provide an outline of the current usage and perception of poster presentation, with a view to increasing our potential to communicate and transfer knowledge effectively using the poster medium.

Importance / benefits of the research
An awareness of your experiences and opinions is important to be able to better understand the overall concept of poster presentations, within the academic and scientific context.

What will happen if I take part ?
You have the right to choose to participate in this study or not. If you decide to participate in this study then please complete the attached questionnaire and return it to the researcher. You can do this either by returning it directly or dropping it at the marked collection point. You may also complete the survey on-line or by requesting an e-mail copy of the survey – please contact the researcher at: *xxxxxxxx (redacted)*

Completion and return of the survey will indicate your consent to participate in the study. If for some reason you decide you wish to withdraw your data from the study, identifiable questionnaires will be removed and destroyed upon written request within 3 months of the survey date.

What will happen to the results of the research study ?
The results of this research study will be compared with similar research and will also be adapted for publication within professional / academic journals as well as a PhD thesis on the topic. In addition, answers to Q12 will be fed back to FEBS and EMBO to help inform arrangements for future conferences.

Confidentiality
Your anonymity is protected in that the questionnaire does not require your name. If you choose to include your personal / professional details, they will remain confidential at all times. Data will be collected, stored, analysed and disseminated in accordance with: Personal Data Act (523/1999) – Finland / Data Protection Directive 95/46/EC – EU, and the Data Protection Act 1988 / SI 535 2003 – UK. Data will be held only for this specific designed purpose. No personal information will be disclosed to unauthorised persons and no identifying details will be disclosed either in the analysis of the study data or any work resulting from the study.

Complaints
This research has been approved by the Research Ethics Committee of the University of Lapland. It will be conducted in a manner that values and respects the contribution of the participants following the ethical principles of respect, and confidentiality. However as a participant, you have the right to complain if you feel unfairly treated during the research process. The first contact for complaints is: Nicholas Rowe: *xxxxxxxx (redacted*) or you may contact the University directly.

Please return your completed questionnaire to either the researcher in the Poster Hall, or the FEBS booth.

Thank you for considering participation in this research study.

Poster Perception - Presenters & Viewers

UNIVERSITY OF LAPLAND
LAPIN YLIOPISTO

Posters are the most prevalent method of scientific communication at conferences, but they have changed very little since they were introduced and are often perceived as 'lesser' or limited works.

Please take a moment to fill and return this questionnaire ☺

About You: Please select one option:

1 **At this event, which best describes you?**
☐Poster Presenter ☐Speaker ☐Conference Participant ☐Other

2 **Your Sex** ☐Male ☐Female ☐Would Rather Not Say

3 **Your Age** ☐<20yrs ☐<30yrs ☐<50yrs ☐>50yrs ☐Would Rather Not Say

4 **Your Job** ☐Student ☐Professional ☐Scientist ☐ Educationalist
☐Other _____

Your Presentation / Publication Experience: Approximately:

5a **How many poster presentations have you compiled & delivered (at conferences or similar events)?**
☐None ☐1 ☐<3 ☐<5 ☐<10 ☐10+

5b **How many other poster presentations have you helped compile?**
☐None ☐1 ☐<3 ☐<5 ☐<10 ☐10+

5c **How many oral presentations (in the conference setting) have you delivered?**
☐None ☐1 ☐<3 ☐<5 ☐<10 ☐10+

5d **How many peer-reviewed journal articles / papers / texts have you published?**
☐None ☐1 ☐<3 ☐<5 ☐<10 ☐10+

5e **How many international conferences have you attended?**
☐None ☐1 ☐<3 ☐<5 ☐<10 ☐10+

In the Conference Setting & relating to your role as presenter / speaker / participant:
(1 being 'Not at all important' and 5 being 'Very important')

6a **How important would you rate Poster Presentation**
☐1 ☐ 2 ☐ 3 ☐4 ☐5

6b **How important would you rate Oral Presentation**
☐1 ☐ 2 ☐ 3 ☐4 ☐5

6c **How important would you rate Conference Proceeding Papers / Abstract Publication**
☐1 ☐ 2 ☐ 3 ☐4 ☐5

In relation to your career /role:
(1 being 'Not at all important' and 5 being 'Very important')

7a **How important is it to attend conferences**
❑1 ❑ 2 ❑ 3 ❑4 ❑5

7b **How important is it to present at conferences (e.g. oral, poster or workshop)**
❑1 ❑ 2 ❑ 3 ❑4 ❑5

7c **How important is it to publish papers or texts**
❑1 ❑ 2 ❑ 3 ❑4 ❑5

7d **How important are conference presentations to your CV**
❑1 ❑ 2 ❑ 3 ❑4 ❑5

7e **How important are conference presentations to your work/study appraisal**
❑1 ❑ 2 ❑ 3 ❑4 ❑5

In relation to obtaining funding to attend conferences:
(1 being 'Not at all important' and 5 being 'Very important')

8a **How important is it to present at conferences (e.g. oral, poster or workshop) to obtain funding**
❑1 ❑ 2 ❑ 3 ❑4 ❑5

8b **How important is it to demonstrate 'value for money' or the benefit gained from your conference activities**
❑1 ❑ 2 ❑ 3 ❑4 ❑5

How much do you agree with the following statements: Mark with an ' X '							
	1. Strongly Disagree	2. Moderately Disagree	3. Slightly Disagree	4. Neutral	5. Slightly Agree	6. Moderately Agree	7. Strongly Agree
9a **Posters are a good medium for presenting information when they stand alone without author presentation**							
9b **Posters are a good medium for presenting information when they are presented by the author**							
10 **Posters are a good medium for networking and meeting others in your field at conferences / events**							
11a **Posters disseminate information to a wide proportion of the conference audience**							
11b **Posters provide enough information as a stand-alone medium**							
11c **Posters disseminate information beyond the conference event**							
11d **Posters provide benefit to their 'authors' beyond the conference event**							
11e **Posters are a valid form of publication**							
11f **Posters are valued by my peer-community**							
11g **Posters are of value to society**							

12. **What aspects of poster presentation could be further developed to meet user-need: Mark as many as apply:**

☐ 1. Wider exposure to conference delegates

☐ 2. Better organisation of poster sessions

☐ 3. Options to give short presentations

☐ 4. IT / computer presentation

☐ 5. Web hosting of posters and materials

☐ 6. Increased exposure post-conference

☐ 7. Increased employer recognition

☐ 8. Formal publication of poster image and short paper in an on-line repository/journal

☐ 9. Other Comments:

Thank you for completing this survey ☺
Please return it to the researcher in the Poster Hall, or leave it at the dedicated collection point at the FEBS Booth.

You may contact the researcher at: *xxxxxxxx (redacted)*, or please feel free to approach them in the poster hall during the event.

UNIVERSITY OF LAPLAND
LAPIN YLIOPISTO

Appendix 5. Poster Research Interview Guide

Conference Activities & Poster Presentation

Message-based interview guide:

I. Main questions to be sent as individual messages.
II. Follow up or prompt questions (Q) to be asked on receipt of initial answer if needed.
III. Responses to follow standard dialogue as per verbal exchange.

* You can select, highlight or **bold** the answer boxes as needed.

Q1-6 About You:

1 **Are you** ☐Male ☐Female ☐Would Rather Not Say

2 **Your Age** ☐<18yrs ☐<30yrs ☐<50yrs ☐>50yrs ☐Would Rather Not Say

3 **Which country are you from?** _____

4 **What field/area do you work in** _____

5 **What best describes your Job/Role** ☐Student ☐Professional ☐Scientist ☐ Educator ☐Other

6 **Your highest qualification** ☐Under Graduate ☐Graduate ☐ Post-Grad. ☐ Doctorate ☐Other

comment_____

Q7 Your poster/conference experience:

7. **Have you had direct experience of international Academic/Scientific conferences that use the poster medium ?**

☐Yes ☐No

If you have answered 'Yes' to the above question, please proceed ☺

Q8 Your Presentation / Publication Experience:

In the international conference setting, approximately:

8a **How many international conferences have you attended?**
☐None ☐1 ☐≤3 ☐≤5 ☐<10 ☐10+

8b **How many oral presentations have you delivered?**
☐None ☐1 ☐≤3 ☐≤5 ☐<10 ☐10+

8c **How many poster presentations have you compiled & presented?**
☐None ☐1 ☐≤3 ☐≤5 ☐<10 ☐10+

8d **How many poster presentations have you helped compile, but NOT presented?**
☐None ☐1 ☐≤3 ☐≤5 ☐<10 ☐10+

8e **How many peer-reviewed journal articles / papers / texts have you published (author/co- author)?**
☐None ☐1 ☐≤3 ☐≤5 ☐<10 ☐10+

Q9 The importance of conference presentations & publications

On a scale of 1 - 10: (1 being 'Not at all important' and 10 being 'Very important')

9a **How important would you rate Oral Presentations at conferences?**
☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 ☐8 ☐9 ☐10

9b **How important would you rate Poster Presentations at conferences?**
☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 ☐8 ☐9 ☐10

9c **How important would you rate the Abstracts published in Conference Proceedings?**
☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 ☐8 ☐9 ☐10

9d **How important would you rate Papers published in Conference Proceedings?**
☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 ☐8 ☐9 ☐10

9e **How important would you rate conference Abstracts published in external journals?**
☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 ☐8 ☐9 ☐10

9f **How important would you rate conference Papers published in external journals?**
☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 ☐8 ☐9 ☐10

Next ...

Open Response Questions

- Please rate your importance on a scale of 1–10
  (1 being 'Not at all important' and 10 being 'Very important')
  – You can highlight or **bold** the boxes if needed.
- Give your response to each main question, and use the prompt questions (Q) to give any further information.
- You may give as much or as little information as you want.

Attending Conferences
On a scale of 1–10 (1 being 'Not at all important' and 10 being 'Very important')

10. Tell me how important you feel is it to attend conferences?

☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 ☐8 ☐9 ☐10

Notes:

Q. Why is this important?

11. Tell me how important you feel is it to present at conferences, rather than just attend?

☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 ☐8 ☐9 ☐10

Notes:

Q. Why is this important ?

12. What do you think motivates you more: your desire to attend a conference, or your desire to present during a conference ?

Answer:

Q. Is it important to be seen to <u>contribute</u> to the conferences you attend?

Q. Who (aside from yourself) may be keen for you to attend conferences?

Q. If they have an interest in your activities (e.g. they are your employer or funder) - what do you think they expect or want from your attendance?

Q. Do your employer or funder 'get' anything from it (e.g. reputation, publicity, information dissemination etc.)?

Q. How does your attendance &/or presentation fulfil their needs?

13. How important is it for you to publish papers or texts in mainstream journals/books ?

☐1 ☐ 2 ☐ 3 ☐4 ☐5 ☐6 ☐ 7 ☐ 8 ☐9 ☐10

Notes:

Q. Why is this important?

14. How important are Conference Publications to you ? (your own, & those of others ?)

☐1 ☐ 2 ☐ 3 ☐4 ☐5 ☐6 ☐ 7 ☐ 8 ☐9 ☐10

Notes:

Q. Do published conference <u>papers</u> carry the same importance for you as journal articles/books? Why?

Q. What about <u>unpublished</u> papers & posters (the things you listen to & see at conferences) – how important are these in the long/short term ?

Q. Do conference <u>abstracts</u> carry the same importance for you as journal articles/books? Why?

How oral/poster presentations benefit your career

15. How important are conference presentations to your work/study appraisal?

☐1 ☐ 2 ☐ 3 ☐4 ☐5 ☐6 ☐ 7 ☐ 8 ☐9 ☐10

Notes:

Q. Do they make a difference to your career or job prospects?

Q. How important are conference presentations for your CV?

☐1 ☐ 2 ☐ 3 ☐4 ☐5 ☐6 ☐ 7 ☐ 8 ☐9 ☐10

Notes:

16. How important is it to present at conferences (e.g. oral, poster or workshop) to obtain funding to attend conferences?

☐1 ☐ 2 ☐ 3 ☐4 ☐5 ☐6 ☐ 7 ☐ 8 ☐9 ☐10

Notes:

Q. Are you aware of funders (either research funders or employers) making presentation a prerequisite to supporting conference attendance?

Notes:

Q. Have you ever submitted an abstract just to gain funding to attend a conference?

Notes:

Q. How important is it to demonstrate 'value for money' or the 'benefit' gained from your conference activities?
☐1 ☐ 2 ☐ 3 ☐4 ☐5 ☐6 ☐ 7 ☐ 8 ☐9 ☐10

Notes:

Q. Do you have any examples of how you have done this ?

Notes:

Q. Do you think poster presentation provides funders with a value for money activity, in regards to the dissemination of the research they fund?

Notes:

Questions on Poster Presentations

17. Are posters are a good medium for *presenting information* when they stand alone without author presentation ?

Definitely not ☐1 ☐ 2 ☐ 3 ☐4 ☐5 ☐6 ☐ 7 Definitely so

Notes:

Q. Why?

18. Are posters a good medium for networking and meeting others in your field at conferences / events?

Definitely not ☐1 ☐ 2 ☐ 3 ☐4 ☐5 ☐6 ☐ 7 Definitely so

Notes:

Q. Why?

Q. Does presenting a poster noticeably increase your level of conference interaction more than just attending?

Q. As a delegate, do you tend to interact with poster presenters much at conferences?

Q. What influences this?

19. Are posters are a good medium for presenting information when they are presented by the author?

Definitely not ☐1 ☐ 2 ☐ 3 ☐4 ☐5 ☐6 ☐ 7 **Definitely so**

Notes:

Q. Why?

20. Have your own posters gained much meaningful attention at conferences?

No interest ☐1 ☐ 2 ☐ 3 ☐4 ☐5 ☐6 ☐ 7 **High interest**

Notes:

Q. What sort of numbers of delegates discuss your poster with you during scheduled sessions?

Q. How much of the conference audience (e.g. % of delegates) do you feel individual posters disseminate information to?

21. Do posters usually contain enough information for you or others to act on or use in practice?

Definitely not ☐1 ☐ 2 ☐ 3 ☐4 ☐5 ☐6 ☐ 7 **Definitely so**

Notes:

Q. What helps or hinders this?

Q. Do you need more information than can be given in the normal conference poster?

Q. Is there a difference between traditional & electronic poster formats in this regard?

Q. Do abstracts of posters provide information reliable enough to act as standalone information?

22. Do you read through all of the abstracts that are provided in conference proceedings?

Never ☐1 ☐ 2 ☐ 3 ☐4 ☐5 ☐6 ☐ 7 **Always**

Notes:

23. Do you feel posters disseminate information beyond the conference event ?

Definitely not ☐1 ☐ 2 ☐ 3 ☐4 ☐5 ☐6 ☐ 7 **Definitely so**

Notes:

Q. Is this important?

Q. What benefit would poster presented information offer to those outside the conference event?

24. What benefit do posters provide to their '*authors*' beyond the conference event?

No benefit ☐1 ☐ 2 ☐ 3 ☐4 ☐5 ☐6 ☐ 7 **High benefit**

Notes:

25. Are posters a valid form of publication?

Definitely not ☐1 ☐ 2 ☐ 3 ☐4 ☐5 ☐6 ☐ 7 **Definitely so**

Notes:

Q. What do you consider 'published' to mean?

Q. What might be the positive/negative impacts of making poster presented information more freely available?

26. Do you feel posters are valued by the peer-community?

Definitely not ☐1 ☐ 2 ☐ 3 ☐4 ☐5 ☐6 ☐ 7 **Definitely so**

Notes:

Q. What might give them more value?

27. What aspects of poster presentation could be further developed to meet user-need:
Mark & comment on as many as apply:

□1. Wider exposure to conference delegates
Comment:

□ 2. Better organisation of poster sessions
Comment:

□ 3. Options to give short presentations
Comment:

□4. IT / computer presentation
Comment:

□ 5. Web hosting of posters and materials
Comment:

□6. Increased exposure post-conference
Comment:

□ 7. Increased employer recognition
Comment:

□ 8. Formal publication of poster image and short paper in an on-line repository/journal
Comment:

□ 9. Other
Comment:

28. <u>Final question</u>: List the top 3 needs <u>you</u> have when presenting a conference poster
(e.g. disseminate my work, discuss my work with colleagues, get feedback, create contacts etc.)

1)
2)
3)

Do you have any other comments / thoughts on conference poster presentations?

Comment:

Thank you for taking part in this interview ☺
You may contact the researcher at any time at: *xxxxxxxx (redacted)*

UNIVERSITY OF LAPLAND
LAPIN YLIOPISTO

Appendix 6. Published articles included as sub-studies in this thesis

Sub-Study I
Ilic, D., Rowe, N. (2013). What is the evidence that poster presentations are effective in promoting knowledge transfer? A state of the art review. *Health Information and Libraries Journal*, 30(1), 4-12. doi: 10.1111/hir.12015

Sub-Study II
Rowe, N. (2013). Tracing the 'grey literature' of poster presentations: a mapping review. *Health Information and Libraries Journal*, 34(2), 106-124. doi: 10.1111/hir.12177

Sub-Study III
Rowe, N., Ilic, D. (2015). Rethinking poster presentations at large-scale scientific meetings: is it time for the format to evolve? *FEBS Journal*, 282(19), 3661-3668. doi: 10.1111/febs.13383

Sub-Study IV
Rowe, N. (2018). 'When you get what you want, but not what you need': the motivations, affordances and shortcomings of attending academic/scientific conferences. *International Journal of Research in Education and Science*, 4(2), 714-729. doi:10.21890/ijres.438394