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article

Defining brokers, intermediaries, and boundary spanners: a systematic review

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Background: A growing literature focuses on the roles of brokers, intermediaries, and boundary spanners (BIBS) in addressing the challenges of transferring research evidence between the research and practice or policy communities.

Aims and objectives: In this systematic review, we examined two research questions: (1) where, how, and when are different BIBS terms (broker, intermediary, and boundary spanner) used? and (2) which BIBS terms get defined, and when these terms are defined, who are BIBS and what do they do?

Methods: We conducted literature searches designed to capture articles on BIBS and the transfer of research evidence. We extracted information about eligible articles' characteristics, use of BIBS terms, and definitions of BIBS terms.

Findings: The search revealed an initial pool of 667 results, of which 277 articles were included after screening. Although we coded 430 separate uses of BIBS terms, only 37.2% of these uses provided explicit definitions. The terms, 'broker' and 'brokerage', were commonly applied in the health sector to describe a person engaged in multiple functions. The term, 'intermediary', was commonly applied in the education sector to describe an organisation engaged in dissemination. Finally, the terms 'boundary spanner' and 'boundary spanning' were commonly applied in the environment sector to describe people or organisations that engage in relationship building.

Discussion and conclusions: Results demonstrated that when BIBS were defined, there were important (albeit implicit) distinctions between terms. Based on these results, we identify archetypal definitions for brokers, intermediaries, and boundary spanners and offer recommendations for future research.

Key words broker • intermediary • boundary spanner • review

Key messages

- Only 37.2% of coded uses of BIBS in articles included explicit definitions.
- Brokers were commonly defined in health as people engaged in multiple functions.
- Intermediaries were commonly defined in education as research-disseminating organisations.
- Boundary spanners were commonly defined in environment as relationship-building entities.

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Background

The use of research evidence in decision making depends, in part, on its transfer between researchers and practitioners or policymakers. However, there are well-documented challenges to the transfer of research evidence. In particular, the transfer of research evidence is characterised by a slow and ‘leaky dissemination pipeline’ where it often takes years for research to be synthesised into reviews and translated into recommendations for practice and policy (Balas and Boren, 2000; Green et al, 2009). Additionally, researchers often fail to include practitioner and policymaker perspectives in the creation of research evidence, leading to findings that are ultimately less relevant (Cvitanovic et al, 2016; Hering, 2016; Neal et al, 2018). Indeed, a lack of communication and support between researchers and practitioners or policymakers can hinder adoption and subsequent efforts to implement evidence-based practices (Wandersman, 2003; Wandersman et al, 2008). Challenges to the transfer of research evidence are widespread and are recognised across multiple sectors spanning health (Glasgow et al, 2003; Green et al, 2009; Oliver et al, 2014), education (Cooper et al, 2009; Neal et al, 2018), and the environment (Fazey et al, 2013; Cvitanovic et al, 2015).

A growing body of scholarly work focuses on the roles of brokers, intermediaries, and boundary spanners (BIBS¹) in addressing the challenges of transferring evidence between the research and practice or policy communities. Accompanying this burgeoning empirical work, several recent literature reviews have focused on BIBS’ activities, strategies, skills, or effectiveness (LaRocca et al, 2012; McCormack et al, 2013; Schleifer Taylor et al, 2014; Bornbaum et al, 2015; Elueze, 2015; Van Eerd et al, 2016; Cranley et al, 2017; Sarkies et al, 2017; Mallidou et al, 2018; Thompson and Schwartz Barcott, 2019; Oktari et al, 2020). However, in order to understand these features of BIBS, it is first necessary to understand how different BIBS terms (broker, intermediary, boundary spanner) are used and defined in the literature.

More clarity is needed regarding the *use of BIBS terms* across the literature. Specifically, there may be variation in *where* BIBS terms are used, *how* these terms are studied, and *when* BIBS terms were most likely to be applied. First, BIBS are commonly described in the literature on health (for example, Dobbins et al, 2009; Long et al, 2013), education (for example, Daly et al, 2014; DeBray et al, 2014; Neal et al, 2019), and the environment (for example, Cvitanovic et al, 2015; Bednarek et al, 2018; Posner and Cvitanovic, 2019). However, there is more limited information about the differential use of BIBS terms across these sectors. Second, in a recent review, MacKillop et al (2020) described a ‘lack of engagement with...methods questions’ as a weakness in the literature on BIBS. Although qualitative, quantitative, and mixed methods approaches can be used to study BIBS (for example, Posner and Cvitanovic, 2019), we know little about how each of these methodological approaches is applied across BIBS terms. Third, although research on BIBS has evolved over the last 20 years, there is limited information about the extent to which different BIBS terms have been used across time.

More clarity is also needed regarding the *definitions of BIBS terms* across the literature. For example, [MacKillop et al \(2020\)](#) identified inconsistencies in definitions as a major limitation in the literature on BIBS. Some papers that invoke the roles of BIBS neglect to define the terms that they use, leaving their meaning implicit and ambiguous to readers. Additionally, it is unclear if there is variation in *which* terms (for example, brokers, intermediaries, boundary spanners) are most likely to be defined in the literature, and the extent to which different sectors may favour one term over others. Even when papers do explicitly define BIBS, definitions vary on multiple dimensions. First, definitions vary in *who* is counted as BIBS. Some definitions only count people, some only count organisations, and some count both people and organisations as possible actors in these roles. Second, definitions vary in their descriptions of *what* BIBS do. In particular, definitions can emphasise the function of BIBS as ‘capacity builders’ who develop researchers’ skills in communicating research or practitioners’ and policymakers’ skills in using research, as ‘knowledge managers’ who disseminate and translate research, or as ‘linkage agents’ who facilitate the formation of relationships ([Bornbaum et al, 2015](#); [Ward et al, 2009](#)).

Clarifying and exploring variation in the use and definitions of BIBS terms is important for advancing research on evidence-based decision making for multiple reasons. First, clarifying the use of BIBS terms can help determine whether different sectors are speaking a common language or whether they are describing distinctly different things when discussing these roles. Identifying such sectoral or disciplinary differences is necessary for facilitating the interdisciplinary study and understanding of BIBS and knowledge transfer. It can also help determine whether certain terms are more commonly paired with distinct research methods and whether certain terms have been favoured at different points in time. Second, clarifying definitions of BIBS can help determine whether different terms (broker, intermediary, boundary spanner) are synonyms, or whether they reflect meaningful conceptual differences. Understanding these definitions can be important for theory building by potentially highlighting a typology of BIBS roles. Third, clear definitions of BIBS terms can lead to better operationalisation of these roles. Better operationalisation would allow improved measurement of these roles in natural settings and provide direction for interventions to encourage the implementation of evidence-based practices.

Although a few prior reviews have aimed to clarify the use and definitions of BIBS, some have focused on restricted timeframes or topics (for example, collaboration networks, paediatric rehabilitation) ([Long et al, 2013](#); [Schleifer Taylor et al, 2014](#)). A more recent review by [MacKillop et al \(2020\)](#) examined a wider timeframe and set of topics, but only examined 75 papers and did not provide an in-depth analysis of differences between BIBS terms. Here we build on this prior work, reviewing a larger set of papers (N = 277 from a pool of 667) from an unrestricted timeframe that apply BIBS terms in any way, including papers that apply BIBS terms without defining them. We also provide an in-depth analysis of differences between BIBS terms by asking the following questions: (1) where, how, and when are different BIBS terms (broker, intermediary, and boundary spanner) used? and (2) which BIBS terms get defined, and when these terms are defined, who are BIBS and what do they do? We describe the implications of our findings for future research on BIBS and, in an effort to encourage more consistent use of BIBS across a multi-sectoral literature, we identify archetypal definitions for brokers, intermediaries, and boundary spanners and offer recommendations for future research.

Methods

To complete our systematic review of BIBS definitions, we used the guidelines set forth in the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement (Moher et al, 2009). The systematic review did not include a prospectively registered review protocol.

Eligibility criteria

Theoretical, empirical, methodological, and review papers were included in the current systematic review if they met the following eligibility criteria. First, included papers were written in English. Second, included papers were published as peer-reviewed journal articles. Third, included papers provided relevant discussions of BIBS and the transfer of research evidence in one of the following sectors: health, education, or environment. Articles were excluded as irrelevant if they only tangentially referenced BIBS or if they discussed BIBS in a context other than the transfer of research evidence (for example, technology transfer, culture brokerage, service brokerage).

Search strategy

All literature searches were conducted on January 22, 2020. To locate relevant articles for our review, the research team developed two sets of search terms: one set designed to capture BIBS terms (for example, broker, intermediary, boundary spanner; and one set designed to capture terms commonly used to reference the transfer of research evidence (for example, 'knowledge transfer', 'knowledge utilisation', 'evidence based'; see Table 1 for a full specification of our searches). To be included, the abstract of articles needed to include at least one search term from each of these two sets. Searches were performed in three databases designed to capture a range of articles in the health, education, social services, and environment sectors (Proquest, EBSCO, and PubMed). The Proquest search captured additional databases including ABI/INFORM, ERIC, and PsychINFO. The EBSCO search captured the CINAHL database. We excluded the Cochrane database because it largely overlapped with our PubMed search. Additionally, we excluded the JSTOR database because it limits the length of search queries, making it impossible to simultaneously apply all of our specified search terms.

Article selection

We combined the results of our three searches into a single CSV file, then used four separate steps to select eligible articles for the review. First, we conducted a preliminary screening of the search results, eliminating duplicate entries and items that were not written in English or that were not peer-reviewed journal articles. Second, two authors independently screened all article abstracts to determine whether they met our review eligibility criteria. Any disagreements were discussed by all three authors until they came to a consensus on inclusion or exclusion. Third, full-text PDFs of all remaining articles were downloaded and reviewed by at least one of the three authors to determine whether they met our review eligibility criteria. At this

Table 1: Search strategy

Information source (N)	Electronic search strategy	Limits
Proquest (507)	AB(broker OR brokers OR brokerage OR brokering OR intermediary OR intermediaries OR 'boundary spanner' OR 'boundary spanners' OR 'boundary spanning') AND AB('knowledge transfer' OR 'knowledge utilisation' OR 'use of research' OR 'research use' OR 'use of evidence' OR 'evidence use' OR 'evidence informed' OR 'research informed' OR 'research based' OR 'evidence based' OR 'using research' OR 'using evidence' OR 'research practice' OR 'research to practice')	Exclude duplicates and restrict to scholarly journals
EBSCO (434)	AB(broker OR brokers OR brokerage OR brokering OR intermediary OR intermediaries OR 'boundary spanner' OR 'boundary spanners' OR 'boundary spanning') AND AB ('knowledge transfer' OR 'knowledge utilisation' OR 'use of research' OR 'research use' OR 'use of evidence' OR 'evidence use' OR 'evidence informed' OR 'research informed' OR 'research based' OR 'evidence based' OR 'using research' OR 'using evidence' OR 'research practice' OR 'research to practice')	Restrict to academic journals
PubMed (237)	((broker[Title/Abstract] OR brokers[Title/Abstract] OR brokerage[Title/Abstract] OR brokering[Title/Abstract] OR intermediary[Title/Abstract] OR intermediaries[Title/Abstract] OR 'boundary spanner'[Title/Abstract] OR 'boundary spanners'[Title/Abstract] OR 'boundary spanning'[Title/Abstract])) AND ('knowledge transfer'[Title/Abstract] OR 'knowledge utilisation'[Title/Abstract] OR 'use of research'[Title/Abstract] OR 'research use'[Title/Abstract] OR 'use of evidence'[Title/Abstract] OR 'evidence use'[Title/Abstract] OR 'evidence informed'[Title/Abstract] OR 'research informed'[Title/Abstract] OR 'research based'[Title/Abstract] OR 'evidence based'[Title/Abstract] OR 'using research'[Title/Abstract] OR 'using evidence'[Title/Abstract] OR 'research practice'[Title/Abstract] OR 'research to practice'[Title/Abstract]))	No additional restrictions

stage, all papers that were coded by one of the authors as not relevant to the review were discussed by all three authors until they came to a consensus on inclusion or exclusion. Fourth, during the data extraction and coding process below, the authors identified a small number of articles cited in our pool of eligible articles that were not uncovered by our initial search. These were added to the articles included in our review.

Data extraction and definition coding

We reviewed the full text of each included article in our review, aiming to extract the following data items:

- *Article characteristics:* We extracted the areas addressed in the article (health, education, the environment), open-access status, corresponding author country, author setting (were any authors affiliated solely with a practice setting), and

article type (empirical, systematic review or meta-analysis, research protocol, or other). If articles were empirical, we also extracted the methods used (quantitative, qualitative, mixed) and country or countries where data were collected.

- *Use of BIBS terms or one of their variants:* We extracted whether or not the article used each of the BIBS terms or one of their variants (for example, brokerage, brokering, boundary spanning).
- *Definitions of BIBS terms:* If defined we extracted definitions for each of the BIBS terms used in the article. Here, we were looking for explicit definitions of BIBS terms that used phrases like ‘a broker is...’ or ‘boundary spanning refers to...’.

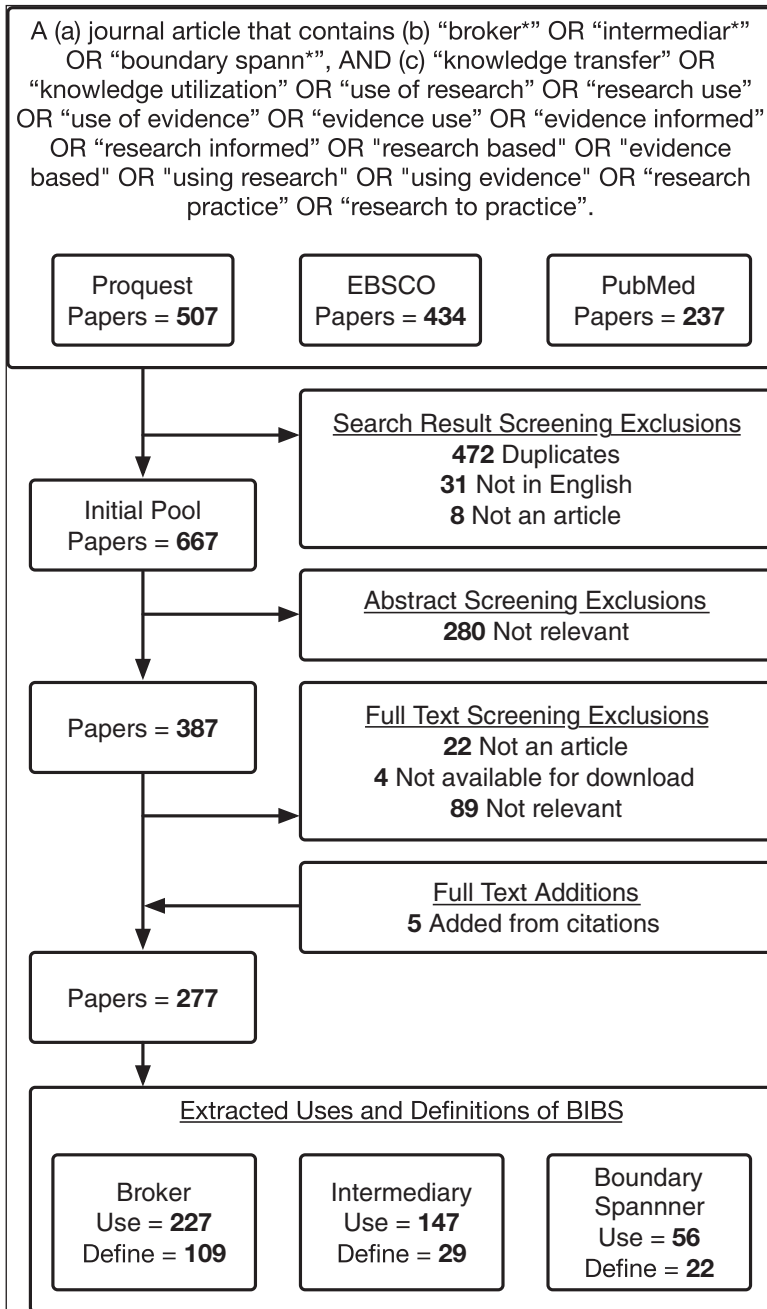
All three authors first completed extraction of data items as a group on a random subset of 10 articles, discussing discrepancies and refining the data extraction process. Data were then extracted from each of the remaining articles by one of the authors. If an author experienced any ambiguity in extracting the data, they flagged the article and it was discussed by all three authors until consensus was reached.

We then coded two characteristics of the extracted BIBS definitions. First, we examined how these papers defined *who* BIBS are by coding whether definitions identified BIBS as people (1 = yes, 0 = no) and whether definitions identified BIBS as organisations (1 = yes, 0 = no). These codes were not mutually exclusive; a definition could simultaneously identify BIBS as including both people and organisations. Second, we examined how these papers defined *what* BIBS do by coding whether definitions emphasised BIBS’ function as building capacity through training, mentorship or building skills to use research (1 = yes, 0 = no), building relationships between researchers and practitioners or policymakers by improving communication between groups, facilitating interactions, or leveraging social networks (1 = yes, 0 = no), and disseminating research by packaging or synthesising research evidence or translating research evidence (1 = yes, 0 = no). Again, these codes were not mutually exclusive; a single definition could be coded to include any combination of these functions. All three authors coded the definitions of five random articles together, then definitions from the remaining articles were coded by at least one of the authors. If an author experienced any ambiguity in coding a definition, they flagged the article and it was discussed by all three authors until consensus was reached.

Data synthesis and presentation

To synthesise our findings concerning how brokers, intermediaries, and boundary spanners are invoked in the literature, we organised the coded data using a series of six cross-tabulations. Specifically, we examined cross-tabulations by sector to understand *where* each term is used, by empirical method to understand *how* each term is studied, by time period to understand *when* each term is used, by definition status to understand *which* terms are defined, by occupant to understand *who* plays each role, and by function to understand *what* each role does. For each cross-tabulation, we computed a Fisher’s exact test to identify statistically significant associations. The data and code necessary to replicate the analyses presented below are available at <https://osf.io/nuhg8/>.

Figure 1: PRISMA Flowchart: Process for systematically searching literature and extracting definitions of BIBS



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Table 2: Characteristics of papers included in the review

Characteristic	Number of papers (%)
Uses 'broker'	227 (81.9)
Defines 'broker'	109 (48)
Uses 'intermediary'	147 (53.0)
Defines 'intermediary'	29 (19.7)
Uses 'boundary spanner'	56 (20.2)
Defines 'boundary spanner'	22 (39.3)
Health	202 (72.9)
Education	46 (16.6)
Environment	29 (10.5)
Empirical	153 (55.2)
Qualitative	92 (60.1)
Quantitative	33 (21.6)
Mixed	28 (18.3)
Review	23 (8.3)
Protocol	9 (3.2)
Other (for example, Commentary)	92 (33.2)
United States	72 (26.0)
United Kingdom	46 (16.6)
Canada	83 (30.0)
Australia	24 (8.7)
Open Access	98 (35.4)
Author in a practice setting	79 (28.5)

Findings

Selected articles

As illustrated in the PRISMA flowchart in [Figure 1](#), our three literature searches resulted in 1,178 initial search results for review: 507 from Proquest, 434 from EBSCO, and 237 from PubMed. First, during a preliminary screening of the search results, 472 duplicates, 31 non-English entries, and 8 entries that were not articles were removed from consideration, leaving an initial pool of 667 search results. Second, the titles and abstracts of each of these results were screened, leading to the exclusion of 280 search results that were not relevant to BIBS or the transfer of research evidence. Third, we reviewed the full-text of the remaining 387 search results, excluding an additional 22 entries that were not articles, 4 entries that were unavailable for download, and 89 entries that were not relevant to BIBS or the transfer of research evidence. Fourth, we added 5 articles cited in our pool of eligible articles that were not uncovered by our initial search. This resulted in a final sample of 277 articles included in our review.

Table 3: Uses of brokers, intermediaries, and boundary spanners

Characteristic of term's use	Broker	Intermediary	Boundary spanner
<i>Where are BIBS used? (p = 0.0182)</i>			
Health	170	95	31
Education	35	35	13
Environment	22	17	12
<i>How are BIBS studied? (p = 0.9696)</i>			
Qualitative	70	53	22
Quantitative	26	20	9
Mixed method	23	16	5
<i>When are BIBS used? (p = 0.8831)</i>			
2000–2004	5	3	1
2005–2009	28	19	5
2010–2014	77	41	20
2015–2020	117	84	30
<i>Which BIBS terms get defined? (p ≤ 0.001)</i>			
Defined	109	29	22
Not defined	118	118	34
<i>Who are BIBS? (p = 0.0058)</i>			
Person only	29	5	5
Organisation only	8	13	6
Both	17	9	7
<i>What do BIBS do? (p = 0.0187)</i>			
Capacity only	4	3	0
Dissemination only	19	8	3
Relationship only	43	4	11
Multiple	37	8	2

Table 2 provides descriptive characteristics of the papers included in our review. The term ‘broker’ was the most commonly used in 81.9% of papers, while ‘intermediary’ (53%) and ‘boundary spanner’ (20.2%) were used less often. Among papers using each of these terms, a definition was most often provided for broker (48%), followed by boundary spanner (39.3%), while only 19.8% of papers using the term intermediary provided a definition. A majority of papers included in this review are from the health sector (72.9%), while fewer are from education (16.6%) or environment (10.5%) sectors. This reflects in part the types of papers indexed in ProQuest, EBSCO, and PubMed, but also reflects the unevenness with which these terms have penetrated different literatures. A majority of papers report empirical research (55.2%), among which most use qualitative methods (60.1%), while fewer papers are reviews (8.3%) or commentaries (33.2%). Over 80% of the papers included in this review were written by first authors located in the US, UK, Canada, or Australia. This reflects our exclusion of non-English language papers, but also reflects the well-documented Western-centric nature of academic publication. Interestingly, although all of these papers were focused on translating research into practice and policy settings, only about

one third (35.4%) were published open access, while the rest were behind publisher paywalls. Additionally, although all of these papers were published in traditional peer-reviewed journals, 28.5% included at least one author located solely in a practice setting, indicating that they represent both researchers' and practitioners' views of BIBS.

Uses of brokers, intermediaries, and boundary spanners

Table 3 reports a series of cross-tabulations that explore how brokers, intermediaries, and boundary spanners are used in the literature. For example, the value 170 in the upper left corner of the first panel indicates that our literature review revealed 170 instances that 'broker' or 'brokerage' was used in health. Each cross-tabulation is accompanied by a Fisher's exact p-value that tests the statistical significance of the association. In each case where the association was statistically significant, the cell(s) containing larger-than-expected values and therefore driving the association are shaded.

Where are BIBS used? Although references to brokers, intermediaries, and boundary spanners are found across all sectors, we find that specific BIBS terms are disproportionately used in specific research areas ($p = 0.0182$). The role of 'broker' and activity of 'brokerage' are disproportionately used in the health literature, the role of 'intermediary' is used in the education literature, and the role of 'boundary spanner' and activity of 'boundary spanning' are used in the environment literature.

How are BIBS studied? Empirical research that involves BIBS uses a range of analytic methods. We find no evidence that empirical research adopting a particular term is likely to also adopt a particular methodological approach ($p = 0.9696$).

When are BIBS used? Research on knowledge translation has a long history of writing about BIBS, and as this literature has grown, the frequency with which each of these terms is used has increased. However, we find no evidence that particular terms have become more common over time, or that particular terms have fallen out of favour ($p = 0.8831$).

Which BIBS terms get defined? Despite the frequent use of BIBS in the knowledge translation literature, these terms are often left undefined. In the absence of widely accepted definitions, the lack of a definition in a specific paper can lead to ambiguity about exactly what the author has in mind. However, some terms are more likely to be defined than others ($p < 0.001$). Specifically, we find that uses of broker or brokerage are disproportionately likely to be accompanied by a definition, while uses of intermediary are disproportionately unlikely to have a definition.

Who are BIBS? There is substantial variation in who or what plays the role of a broker, intermediary, or boundary spanner. However, we find that certain roles are disproportionately occupied by specific entities ($p = 0.0058$). Specifically, a broker is disproportionately likely to be defined as a person, and brokerage is disproportionately likely to be performed by a person. In contrast, an intermediary is disproportionately likely to be defined as an organisation.

What do BIBS do? Knowledge transfer involves many different skills and activities, which can vary by audience and setting. However, we find that definitions of BIBS in the literature tend to link specific terms to the performance of specific functions ($p = 0.0187$). Intermediaries are disproportionately defined to focus on knowledge dissemination, while boundary spanners are disproportionately defined to focus on building relationships. Finally, although there is wide variation in the functions brokers

are defined as performing, they are disproportionately defined as performing multiple functions including capacity building, knowledge dissemination, and relationship building.

Discussion

There is increasing interest in the roles of BIBS in facilitating communication and knowledge transfer between researchers and the practice and policy communities. Given this growing body of scholarship on BIBS, it is important to explore how these roles are commonly used and defined. In this systematic review, we examined variation in the use of BIBS terms, the extent to which articles using BIBS terms defined these roles, and differences in definitions across terms.

Summary of results

In our systematic review, we found no differences in *how* BIBS terms were studied and *when* BIBS terms were used. However, we did find significant differences in *where* BIBS terms were used. Specifically, health articles disproportionately used the terms ‘broker’ and ‘brokerage’, education articles disproportionately used the term ‘intermediary’, and environment articles disproportionately used the terms ‘boundary spanner’ and ‘boundary spanning’. These findings suggest that different sectors may apply distinct language to discuss roles involved in the transfer of evidence between the research and practice or policy communities. Therefore, researchers interested in promoting interdisciplinary perspectives of BIBS should be attuned to the challenges these linguistic differences present for promoting learning and the cross-fertilisation of ideas across sectors.

BIBS terms are commonly used without providing an explicit definition. Although we coded 430 separate uses of BIBS terms in our review, only 37.2% of these uses provided explicit definitions. The presence of explicit definitions depended, in part, on *which* BIBS term was used. The use of terms ‘broker’ and ‘brokerage’ were significantly more likely to be accompanied with explicit definitions while the use of the term ‘intermediary’ was significantly less likely to be accompanied with explicit definitions. The lack of explicit definitions is problematic because, as we observed among the explicit definitions that were provided, there is substantial variation in the conceptualisation of *who* BIBS are and *what* they do. As a result, when these terms are not defined, it is often unclear what researchers mean, which hinders efforts to build theory around the roles, activities, and effectiveness of BIBS.

Archetypal definitions

Our findings are consistent with recent conclusions reached by MacKillop et al (2020) who noted that ‘a plethora of definitions are at play, causing confusion and reiterating past models of knowledge transfer and mobilisation’ (MacKillop et al, 2020: 339), but, although they suggest that general definitions of BIBS are not required, we disagree. Without clear conceptual definitions of BIBS in the literature, we will likely continue to see researchers use and define BIBS terms haphazardly and interchangeably, adding to the confusion and making it difficult to advance theory and measurement. The literature we have reviewed points to certain patterns in how ‘brokers’, ‘intermediaries’,

Table 4: Archetypal definitions

Term	Definition
Broker	<p>'The idea of having a knowledge broker has emerged... This person's role is to build relationships between the two communities, to help facilitate the flow of information, and to help workplace parties see the relevance and applicability of the research to their decision making...' (Kramer et al, 2004: 1).</p> <p>'The knowledge broker provides the necessary human element of interaction, communication, mentoring, skills building and knowledge sharing (known as the "human interface") required for effective evidence-based health promotion practice' (Armstrong et al, 2007: 259).</p> <p>'Knowledge brokers are those people who provide the bridge between the knowledge (or research evidence) and the decision makers... The activities of knowledge brokers are diverse, including the formal transmission of research findings to decision makers...' (Ritter 2015: 106).</p> <p>'In the health care context, knowledge brokering can be carried out formally and informally by a variety of people including researchers and clinicians, with a goal of facilitating knowledge sharing within, between, or across groups and organisations, and with a variety of stakeholders. Knowledge brokers bridge different disciplines and sectors by developing a common language, by fostering interactions...' (Glegg and Hoens, 2016: 115).</p> <p>'KBs [Knowledge brokers] are individuals positioned at the interface between researchers and knowledge users who can enhance communication to facilitate research uptake, and bridge the research-to-practice gap.... They lead to the development of ideas, or management of a particular common interest shared by their colleagues, and facilitate learning.' (Hurtubise et al, 2016: 187).</p>
Intermediary	<p>'Intermediary refers to the organisations dedicated to knowledge transfer and mobilisation...' (Gagnon et al, 2019: 9).</p> <p>'... organisations that act as intermediaries that build awareness of, provide access to, and help make sense of relevant research-based knowledge...' (Rodway, 2019: 4).</p>
Boundary spanner	<p>'... we define the practice of boundary spanning as work to enable exchange between the production and use of knowledge to support evidence-informed decision-making in a specific context and boundary spanners as individuals or organisations that specifically and actively facilitate this process.' (Bednarek et al, 2018: 1176).</p> <p>'Boundary spanning is defined as "work to enable exchange between the production and use of knowledge to support evidence-informed decision making in a specific context", while boundary spanners are the "individuals or organisations that specifically and actively facilitate this process" (following Bednarek et al, 2018).' (Posner and Cvitanovic, 2019: 141-142).</p>

and 'boundary spanners' have been defined in the past literature, and point to some consistent distinctions between these terms. By drawing on these patterns, we can point to archetypal definitions of these terms (see Table 4). Such archetypal definitions can help guide researchers in their choice of BIBS terminology and help ward off potential confusion.

First, we found that the terms, 'broker' and 'brokerage', were commonly applied in the health sector to describe a person engaged in multiple functions including capacity building, dissemination, and relationship building. Table 4 provides five archetypal definitions from the health sector of the term 'broker' that illustrate this pattern (Kramer et al, 2004; Armstrong et al, 2007; Ritter, 2015; Glegg and Hoens, 2016; Hurtubise et al, 2016). In each case, 'brokers' are clearly defined as individuals, people, or humans. Additionally, in all cases, 'brokers' are defined as fulfilling multiple functions. For example, Glegg and Hoens (2016) define 'brokers' as fulfilling a

dissemination function ('facilitating knowledge sharing') and a relationship-building function ('fostering interactions', Glegg and Hoens, 2016: 115), while Armstrong et al (2007) define 'brokers' as capacity building noting that brokers provide 'interaction, communication, mentoring, skills building, and knowledge sharing' (Armstrong et al, 2007: 259).

Second, we found that the term 'intermediary' was commonly applied in the education sector to describe an organisation engaged in dissemination. Table 4 provides two archetypal definitions from the education sector of the term 'intermediary' that illustrate this pattern (Gagnon et al, 2019). In both cases, intermediaries are clearly identified as organisations that fulfill a dissemination function. For example, they describe intermediaries as 'organisations dedicated to knowledge transfer and mobilisation' (Gagnon et al, 2019: 9).

Third, we found that the terms 'boundary spanner' and 'boundary spanning' were commonly applied in the environment sector to describe a person or organisation engaged in relationship building. Table 4 provides two archetypal definitions from the environment sector of the terms 'boundary spanner' and 'boundary spanning' that illustrate this pattern (Bednarek et al, 2018; Posner and Cvitanovic, 2019). In this case, the definition from Posner and Cvitanovic (2019) follows and builds from the definition offered by Bednarek et al (2018). Both definitions allow for both individual and organisational 'boundary spanners' and clearly identify their function as relationship building in the form of 'enabl[ing] exchange between the production and use of knowledge' (Bednarek et al, 2018: 1176).

Recommendations

Based on our systematic review and the archetypal definitions we uncovered in the literature, we provide several recommendations for future theory building and research about BIBS roles. First, consistent with past reviews (MacKillop et al, 2020), we found that more often than not, researchers using BIBS terms neglected to define these terms. This lack of definition renders the use of BIBS terms ambiguous and hinders the development of theory and measurement. To combat this issue, *researchers invoking BIBS terms should explicitly state the term's definition (Recommendation 1)*.

Second, when researchers do define BIBS, they often create new definitions. This adds to the 'plethora of definitions' that are acknowledged as creating confusion within then literature (MacKillop et al, 2020: 339). Our review suggests that archetypal definitions of 'broker', 'intermediary' and 'boundary spanner' already exist in the literature. Consistent use of already existing definitions can help minimise confusion, establish a common language across the literature on BIBS, and lead to advancement in the operational measurement of BIBS. Therefore, whenever possible, *researchers invoking BIBS terms should rely on an already existing definition of the term and provide a citation (Recommendation 2)*.

Third, the archetypal definitions we uncovered in our systematic review suggest that although BIBS terms are sometimes used interchangeably, there are some important (albeit implicit) distinctions in how they are typically defined in the literature. Because there are important distinctions between different BIBS terms, we caution researchers against using these terms interchangeably. *If researchers wish to conceptualise different BIBS terms as synonyms, they should explicitly identify this (Recommendation 3)*.

Finally, the implicit distinctions between BIBS terms offer opportunities for future research. Specifically, future research could compare and contrast the effectiveness of brokers (as people serving multiple functions), intermediaries (as research-disseminating organisations), and boundary spanners (as relationship-building people or organisations) in facilitating the transfer of research evidence to practitioners and policymakers. *Researchers should aim to build a theory of BIBS by testing the extent to which distinctions between 'brokers', 'intermediaries', and 'boundary spanners' have implications for these entities' effectiveness (Recommendation 4).*

Strengths and limitations

This systematic review has multiple strengths. First, our review takes a wide scope, clarifying BIBS definitions across an unrestricted timeframe and multiple terms. In this sense, it extends past reviews of BIBS definitions that have been more restricted in timeframe and scope (for example, only focusing on BIBS within the context of collaboration networks; Long et al, 2013). Second, unlike past reviews which have often focused on examining BIBS within a single sector (Bornbaum et al, 2015; Cranley et al, 2017), our review takes a multi-sector approach that includes articles dealing with health, education, and the environment. This multi-sector approach is critical for establishing a common language and clarifying BIBS definitions across fields. Third, this review sought to identify all uses of BIBS terms, not only definitions, which allows us to determine how often the meanings of these terms are explicitly defined or left undefined.

Despite these strengths, there are also some limitations to the scope of our review. First, our review only focused on uses of BIBS in research dealing with health, education, and the environment. Therefore, we are unable to draw conclusions about definitions of BIBS in other sectors such as business. Second, our review only focused on the terms 'broker', 'intermediary' and 'boundary spanner'. Although we suspect that these are among the most common terms used in the literature, we are unable to draw conclusions about definitions of other related terms in the literature such as 'linkage agent' or 'bridge'. Our review included articles using these terms if they occurred in conjunction with our focal terms (for example, 'a broker is a linkage agent'), but not articles using these terms without any reference to BIBS. Third, our review focused on articles that used any of a set of common terms related to the transfer of research evidence (for example, 'knowledge transfer', 'knowledge utilisation', 'evidence based'). Although we suspect these are among the most common terms used in this literature, other specialised terms may occur in specific disciplines; we are unable to draw conclusions about uses or definitions of BIBS in articles that do not refer to the transfer of research evidence using these common phrases.

Conclusion

Research on evidence-based decision making and knowledge transfer frequently refers to the importance of brokers, intermediaries, and boundary spanners (BIBS) in these processes. In a systematic review of this literature, we found that definitions of BIBS are frequently unstated or implicit. When they are explicitly defined, there is wide variation in who BIBS are and what BIBS do. Research discussing brokers and knowledge transfer is typical in the health sector and often focuses on people engaged

in multiple functions. Research discussing intermediaries and knowledge transfer is typical in the education sector and often focuses on disseminating organisations. Finally, research discussing boundary spanners and knowledge transfer is typical in the environment sector and often focuses on relationship-building people or organisations. Variation and lack of clarity in definitions reduces the utility of the BIBS terms for understanding and facilitating the transfer of evidence. Therefore, it is essential that researchers explicitly define BIBS, which would encourage their consistent conceptualisation and improve their empirical operationalisation in future research.

Note

¹ We use 'BIBS' solely as a shorthand to refer to these three terms, which are the focus of our review. As we show, they are not synonyms.

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Research ethics

The authors have declared that research ethics approval was not required since the paper does not present or draw directly on data from empirical research.

Contributors

JWN conceptualised the research question and design. All Authors coded the data. ZPN performed the analysis. JWN and ZPN drafted the manuscript. All Authors reviewed and revised the manuscript.

Supplementary data

The datasets generated and/or analysed during the current study are available in the Open Science Framework repository at <https://osf.io/nuhg8/>.

Conflict of interest

The authors declare that there are no conflicts of interest.

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