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Faces of informed research: Enabling research collaboration

Clarence Maybee, W. Wayne Booker Chair in Information Literacy, Libraries and School of Information Studies, Purdue University, West Lafayette, IN, USA. Email: cmaybee@purdue.edu. ORCID: [0000-0002-9003-0486](https://orcid.org/0000-0002-9003-0486)

Susan Gasson, Senior Lecturer, Graduate Research School, James Cook University, Townsville, QLD, AUS. Email: susan.gasson@jcu.edu.au. ORCID: [0000-0003-2058-3074](https://orcid.org/0000-0003-2058-3074)

Christine Susan Bruce, Dean, Graduate Research School, James Cook University, Townsville, QLD, AUS. Email: christine.bruce@jcu.edu.au. ORCID: [0000-0002-5809-0702](https://orcid.org/0000-0002-5809-0702)

Mary M. Somerville, University Librarian (retired), University of the Pacific, Stockton, CA, USA. Email: somerville.mary@gmail.com. ORCID: [0000-0002-4201-8335](https://orcid.org/0000-0002-4201-8335)

Abstract

This paper presents the Faces of Informed Research, an information literacy (IL) framework that aims to enhance researchers' capacity to participate productively in collaborative interdisciplinary partnerships. Universities and funding bodies increasingly require collaborative approaches to research initiatives. Beneficial for advancing shared research interests, collaboration often requires overcoming significant variation in disciplinary approaches, including how researchers use information to conduct research, to transition unfamiliar researchers into working relationships. A conceptual development process was undertaken to expand on the Seven Faces of Informed Learning to further adapt the framework to collaborative and interdisciplinary research contexts. Embodying critical components of working together, Informed Research especially supports researchers' collective enablement and enactment of different experiences of using information. Drawing from the pedagogic model Informed Learning Design, an 'informing narrative' illustrates how the recognition of variations in information experience may be used to enrich researchers' collaborative capacity. Future investigation will focus on the role of Informed Research in relationship to 1) research training in higher education, 2) group collaboration 'efficacy,' 3) research, research management and research collaboration leadership, and 4) the importance of information experiences for successful research, collaboration, and writing.

Keywords

Australia; information literacy; informed learning; informed learning design; informed research; interdisciplinary research; research collaboration; US

1. Introduction

This paper presents the Faces of Informed Research, an information literacy (IL) framework that aims to enhance researchers' capacity to participate productively in collaborative

interdisciplinary partnerships. Shown to build research productivity and dissemination, universities and funding bodies increasingly encourage collaborative research approaches (Abramo et al., 2009; McCarty et al., 2013; Rajalo & Vadi, 2017). A partnership between two or more researchers pursuing mutually beneficial research interests naturally presents numerous challenges in building research collaborations across sectoral (Shah & Nair, 2013; Thune, 2011), disciplinary (Biancania et al., 2018; Bridle, 2018; Little, 2017) and national (Payumo et al., 2017; Stead & Harrington, 2000) boundaries. Overcoming such challenges requires that collaborators understand others' perspectives and approaches, including how information use is experienced when conducting research.

The Faces of Informed Research builds upon the pedagogical construct of the Seven Faces of Informed Learning (Bruce, 2008), which supports using information to learn in educational, workplace and community contexts. Informed Research fosters sustainable and productive collaborative research by enabling recognition and enactment of various experiences of using information when conducting research. A story is shared to illustrate the application of Faces of Informed Research within a collaborative research environment. Called an 'informing narrative,' the story draws from lived experiences, enacted in a fictional narrative, to highlight how intentional use of the 'faces' may facilitate the adoption of shared perspectives that enable and enhance collaborative research outcomes.

2. Literature Review

IL is frequently associated with conducting research. This is exemplified by the inclusion of the "Research as Inquiry" 'frame' in the *Framework for Information Literacy for Higher Education* published by the Association of College and Research Libraries (2015). The Research as Inquiry frame construes research in the broadest sense as involving several information-focused practices, such as determining information gaps, selecting appropriate methods to gather and organise information, and so forth. The scholarship relating 'information literacy' to what is often described as 'original' research frequently focuses on developing insights that inform educational efforts to support higher education students. Increasingly these efforts include undergraduate students (Hensley & Davis-Kahl, 2017), but are especially relevant to graduate students expected to engage in research in their future careers (Bussell, Hagman, & Guder, 2017; Grabowsky & Weisbrod, 2020; Jackson, 2013; Lefebvre & Yancey, 2014). While there is little research focusing specifically on IL in collaborative research contexts, IL has been related to interdisciplinary research, which typically involves collaboration between researchers from different disciplines (Gullbekk, Bøyum, & Byström, 2015; Jones, 2012; Newby, 2011; Pilerot, 2016). With few exceptions, such as Pilerot's (2013) investigation of 'trust' related to information sharing by researchers participating in an interdisciplinary network, information-focused research on practicing academics or other career researchers tends to emphasize identifying the needs of and trainings for individual researchers (Exner, 2014; Goldstein, 2012). The current project relates experiences of IL to collaborative research.

While enabling researchers to advance shared research interests, collaboration can present challenges to conducting innovative research. International collaboration may involve a range of barriers including language, intellectual property laws, and research culture (Fox et al., 2017; Noland, 2015; Wagner et al., 2019). Interdisciplinary challenges may range from methodological and theoretical differences to variations in writing and publishing conventions (Biancania et al., 2018; Bridle, 2018; Wall, 2012). Sectoral challenges may include disparity in recognition, use and distribution of new knowledge (Molla & Cuthbert, 2019; Rajalo & Vadi, 2017; Strengers, 2012). While cultural differences play a role, a body of work suggests that researchers, even in the same context, may experience or conceptualize research quite differently (Åkerlind, 2008). Brew (2001), one of the first to explore researchers' experiences of research, uncovered four ways that they do so as: 1) research tasks, 2) discovering hidden meanings within data, 3) publishing and exchanging ideas, and 4) a personal journey of discovery. The latter two

categories that emphasize contributing to a field and personal development are associated with greater research productivity (Brew et al., 2016). The range of foci of researchers' experiences or conceptions of research include establishing research procedures (Brew, 2001; Prosser et al., 2008), fulfilling academic requirements (Åkerlind, 2008; Healey & Davies, 2019; Stubb et al., 2014), exchanging ideas in the field (Brew, 2001; Healey & Davies, 2019; Prosser et al., 2008), linking teaching and research (Healey & Davies, 2019), fostering personal development (Åkerlind, 2008; Brew, 2001; Stubb et al., 2014), and enabling change within the larger community (Åkerlind, 2008; Stubb et al., 2014). Although using similar language, differences in how research is experienced amongst collaborators may result in researchers having difficulty communicating with one another (Brew, 2001).

Bruce (2008) explored researchers' experiences of using information when conducting research, as part of a larger examination at how information is used in learning contexts. Bruce introduced a framework, called Informed Learning, that focuses on the relationship between the experience of information use and learning. The theoretical underpinnings of Informed Learning consider research as one kind of learning in which learning is understood as a change in ways of experiencing aspects of the world (Bowden & Marton, 1998). Bruce (2008) suggests that researchers' experiences of using information would be related to their experiences of research generally. She also noted that researchers may not distinguish between how they use information and how they conduct research—seeing the two as inseparable.

One critical aspect of Informed Learning, a transdisciplinary model (Bruce, 1997) now referred to as the Seven Faces of Informed Learning (Bruce, 2008), describes how learners experience using information to learn. Outlined in Table 1, Informed Learning describes seven distinct experiences of using information within a learning context such as conducting research.

Table 1: Seven Faces of Informed Learning (Bruce, 2008)

	Face	Description
1	Information Awareness	Using technology and networks to communicate and keep abreast of developments in the field
2	Information Sources	Sourcing information to meet a learning need
3	Information Process	Engaging in information processes to learn
4	Information Control	Making connections between information and learning needs
5	Knowledge Construction	Building a knowledge base in new areas of interest
6	Knowledge Extension	Extending an existing knowledge base
7	Wisdom	Making wise use of information for the benefit of others

The Seven Faces of Informed Learning (Bruce, 2008) was used to frame experiences of using information to conduct research as an aspect of collaborative capacity building within a Collaborative Research Culture Framework (Gasson et al., 2020). Developed through an ongoing process of reviewing and analysing relevant literature (e.g., Ceballos et al., 2017; Ratten et al., 2018), the Collaborative Research Culture Framework originally identified three levels of collaborative research culture: 1) trust and respect (Roots), 2) shared interest groups (Fields), and 3) inspiration, innovation and inclusion (Fruits) (Gasson & Bruce, 2018). Collaborative capacity, of which experiences of using information to conduct research are an element, has since been included as an active component of the Framework (Gasson et al., 2020). The early descriptions of how using information may be experienced in a research context (Bruce, 2008) are the starting point for the conceptual exploration undertaken in the current project.

Drawing from Informed Learning (Bruce, 2008), Maybee and colleagues developed Informed Learning Design, a model that guides teachers to enable their students to see new aspects of

using information within a learning context (Maybe et al., 2019). Informed Learning Design is underpinned by the Variation Theory of Learning, which suggests that for learning to occur people must become aware of key differences (that is, variations) between their current experiences and a new way of seeing (Marton, 2014; Marton & Tsui, 2004). In formal educational settings, teachers may act as catalysts for learning by drawing students' attention to the variations of which they are intended to become aware. Informed Learning Design suggests that for informed learning to occur a pattern must take place in which variations are made that highlight both using information and learning, which are then fused so learners may experience both in a new way (Maybe at al., 2019).

In addition to their application in formal educational settings, the ideas outlined by Maybee and his colleagues (2019) would be applicable in collaborative research contexts. Being introduced to variations by colleagues, supervisors, or others would enable researchers to see new aspects of using information as part of conducting research. A solution to Brew's (2001) concern that researchers experiencing research differently may not communicate well could be to intentionally create a shared experience of using information to conduct research amongst collaborators.

3. Conceptual Development

The international team of researchers involved in this project adopt an experiential perspective that guides exploration of research problems and questions. This stance is consistent with research approaches and methodologies, such as phenomenology or phenomenography, that study and illuminate human experience. Guided by this stance, the Faces of Informed Research framework aims to allow stakeholders involved in collaborative research to recognise the varied ways that they and their partners may be experiencing using information while engaged in research.

The framework has two purposes. First, it may be applied in a collaborative research context to enable researchers and other stakeholders to understand the different ways information may be experienced amongst their research partners who are often working across academic disciplines and institutional cultures. The second purpose builds on the recognition of the varied ways researchers engaged in the same collaborative project may experience using information. This purpose informs using the framework pedagogically to enable researchers to expand their awareness of how using information may be experienced when engaged in research. Given the aim and the related purposes of this project, two questions guided the conceptual work:

1. What are the qualitatively different experiences that researchers may have of using information to conduct research?
2. How may the recognition of these experiences be applied in collaborative practice settings to support research development?

To address the two guiding questions, the research team engaged in conceptual work that was comprised of three types of activities: 1) analysing the existing literature, 2) closely examining and expanding a framework that describes how researchers may experience using information in a collaborative research context, and 3) composing and reflecting on an 'informed narrative' to convey how the new framework could be applied in a collaborative research setting.

Primarily addressing the first question, the review of the literature focused on scholarship related to the experiences of researchers generally as well as on researchers' experiences of IL and information use. The results of the review are summarised in the Literature Review section, which highlights that the Seven Faces of Informed Learning (Bruce, 2008) is a framework applicable for describing different experiences that researchers have of using information while engaged in research. The Seven Faces emerged from phenomenographic study findings on the

varied experiences of academics, librarians, and others working in higher education (Bruce, 1997). A decade later, Bruce (2008) noted the applicability of the categories outlined in the Seven Faces for describing different experiences of using information in contexts such as research.

The research team closely examined each category of the Seven Faces of Informed Learning (Bruce, 2008) to identify how its elements would manifest in research settings, including collaborative and interdisciplinary contexts. The team's previous adaptations of the Seven Faces of Informed Learning included co-creation of 'Informed Systems,' a framework that emphasizes using information experience to learn to collaborate across organisational boundaries using co-designed systems (Somerville, 2015), supported their conceptual acumen. Evolving over time, the theoretical analysis resulted in a more targeted description of the seven 'faces' or categories specifically outlining experiences of using information in research settings.

Named the 'Faces of Informed Research,' each category of the framework is described in detail in the following section of the paper. Key stakeholders likely to benefit from the framework were identified as career researchers, research students, advisors, and information professionals, like librarians, who provide research support. After development, the framework was shared with stakeholders through various venues. For example, a seminar was held at one university in which advisors and librarians worked in pairs using the framework to identify support options for research students to deepen understanding of how researchers experience using information. Mentioned in the Literature Review section, an early version of the framework was shared through a journal publication targeting scholars of creative and professional writing education (Gasson et al., 2020). The framework was recently used to support a special interest group for women researchers at a university in Papua New Guinea (Gasson et al., 2021).

The second research question was addressed through the exploration of a pedagogic theory and model that explains how knowledge of researchers' experiences of using information may be used to advance collaborative research endeavours. For this purpose, the team drew ideas from Informed Learning Design, a model that enables teachers to design instruction that allows students to become more aware of new ways of using information within a learning context (Maybee et al., 2019). Informed Learning Design draws from the Variation Theory of Learning, which explains broadly how teachers may 'vary' aspects of a phenomenon being studied to enable learners to develop a more comprehensive experience of that phenomenon (Marton, 2014; Marton & Tsui, 2004). A pedagogic application using the categories developed in phase two is explored through an informed narrative using narrative thinking tools (Clandinin, 2016). While fictional, the informed narrative draws from lived experiences to suggest how the categories of the Faces of Informed Research may be used to create variations that allow researchers and other stakeholders to become aware of new ways to experience using information within a collaborative research environment.

4. Characteristics of the Faces of Informed Research

The seven categories or 'faces' that comprise the Faces of Informed Research are outlined in Table 2. While closely aligned with the original categories from the Seven Faces of Informed Learning (Bruce, 2008), in some cases the names of the categories were changed in Informed Research to best describe different experiences of using information to learn within a research context. The faces are not specific to researchers with different levels of experience or capacity, but rather different ways of experiencing information use while engaged in research. The faces are not necessarily sequential or asynchronous.

Table 2: Faces of Informed Research (Adapted from Bruce, 2008 pp. 138-9 & 148-9)

	Face	Description
1	Field Awareness and Communication	Communicating appropriately within professional networks in research communities
2	Information Sources	Appropriating relevant information from a range of formal and informal sources to inform research
3	Information Processes	Adapting information processes to inform personal and collaborative research needs
4	Information Organization	Organizing information to establish connections between research and information sources
5	Knowledge Base Construction	Engaging critically with information to understand areas of research
6	Knowledge Creation	Generating innovations and creating new knowledge through research, including approaches and solutions
7	Research Gifts	Making wise use of research for the benefit of society

As with Informed Learning (Bruce, 2008), 'information' within an Informed Research context is anything that is informing. Examples range from pre-publication events like conferences or seminars to academic publications in books and journals, empirical data, reports from governments and industries, and online blogs and social media, sounds, or pictures. Information in a research context may also include conversations with other scholars or members of a research community, as well as the experiences of the research team or study participants.

4.1 Field Awareness and Communication

Researchers' experiences aligning with the Field Awareness and Communication category are focused on extending or building their communications networks to maintain awareness of thought, activity, and developments relevant to their work. The characteristics associated with this category are outlined in Table 3. Researchers who experience using information in this way are developing deep understandings of what constitutes information in the context of their research and research collaborations. In addition to a need to become aware of the research being conducted and published related to one's own area of research, there is also a focus on following research trends, commonly used methods, and new interpretations emerging from discourse as a member of a research community.

Information considered useful for maintaining awareness of the field may come from a variety of communication channels that include interactions between researchers within the same field, peer-reviewed journal articles and conference presentations, but also social media interactions, professional organisation list-servs, researcher blogs, and so forth. Field awareness may involve researchers as learners sharing across a group where they find information to inform their research. An example may be early career researchers focused on attending to and fostering an awareness of the field in relation to their own research interests as they engage with various stages of a research project.

Table 3: Characteristics of Field Awareness and Communication

Characteristics	Description
Using information is experienced as...	identifying and using information and communication systems, research fora and networks that provide access to different aspects of scholarly discourse and community engagement
Research activity is experienced as...	staying abreast of research developments or other matters related to research areas of interest as a member of a research community

4.2 Information Sources

Researchers' experiences aligning with the Information Sources category are focused on *finding and evaluating sources of information, both formal and informal, relevant to advancing their research* (see Table 4 for characteristics). The sources sought and evaluated may be the literature from one's field to conduct a literature review to provide a rationale for a research project. Researchers focus on defining and locating high quality sources by a variety of activities, such as determining the ranking of select journals or tracking new publications of key researchers. However, the sources sought may also involve determining, collecting, analysing, and interpreting many forms of information to assess relative value in answering research questions.

The types of information needed and the procedures for collecting them vary widely depending on the field of study, such as conducting a scientific experiment in chemistry, interpreting interview data in communications, or analysing an original text in French literature. Here relevant sources might include field notes, samples, lab journals, interview data or archival texts. Researchers may work collaboratively to maximize their ability to access relevant resources, such as one using professional connections to access original materials in an archive and another applying specialized expertise with big data to mine data from online sources. In addition to working with research collaborators, researchers whose experiences align with this category may also work closely with information professionals and technologists to find and evaluate sources. A researcher may work with an academic librarian to develop a strategy to search a range of relevant databases and review, sort and store relevant results, or a method expert on a data gathering and analysis strategy.

Table 4: Characteristics of Information Sources

Characteristics	Description
Using information is experienced as...	collecting and evaluating sources of relevant information
Research activity is experienced as...	informing a research topic or research question

4.3 Information Processes

Researchers' experiences that align with the Information Processes category are focused on processes engaged in when using information to conduct research. The name of the original category from Informed Learning (Information Process) was changed to plural to suggest the numerous 'processes' researchers may draw from in their work. The characteristics associated with this category are outlined in Table 5. Such processes could be associated with any aspect of qualitative or quantitative research such as engaging with information to understand a research topic, locating and analysing publications for a literature review, collecting and analysing original data, or reporting or implementing findings. The processes may be well established or developed by an individual or a research team drawing from the practices used by researchers in differing disciplines. Researchers may develop their own processes and

deploy technological tools to track and manage various kinds of information used in their work. Researchers may also be guided by existing processes, such as collecting and analysing data for a study, which may follow specific processes outlined by a methodological framework. A researcher reviewing a newly discovered area of research may inform the work of another member of the research team responsible for leading and adapting the application of a particular methodology for that project.

Table 5: Characteristics of Information Processes

Characteristics	Description
Using information is experienced as...	enacting processes to guide information use
Research activity is...	informing any phase of research

4.4 Information Organization

Researchers' experiences aligning with the Information Organization category are focused on making connections between information sources and aspects of research, which may take the form of storing and organizing information, including research data. The characteristics associated with this category are outlined in Table 6. A researcher's projects or interests may inform the way information is stored and sorted with the intent of readily accessing it when needed, such as for a future research project. Researchers who experience using information for research in this way may be interested in technological solutions that can support information storage, organisation, or curation, such as institutional or public repositories. For example, researchers may discuss how best to make a range of data and information available to all researchers in a group or agree on the naming conventions or files for the categorization of information to ensure access and use. Increasingly influenced by the development of institutional repositories, such an approach would also support researchers as learners seeking to make information open access, ensuring the information may be located and reused in the future.

Table 6: Characteristics of Information Organization

Characteristics	Description
Using information is experienced as...	making connections between identified information and aspects of research
Research activity is experienced as...	establishing informational relationships to evolve research

4.5 Knowledge Base Construction

Researchers' experiences aligning with the Knowledge Base Construction category are focused on critically analysing information to understand a topic or research area or the various schools of thought associated with that area (see Table 7 for characteristics).. Researchers are interested in discerning the reliability or credibility of existing research or the positions from which existing inquiry has developed. Interacting with colleagues is an important aspect of how researchers experience using information within this category. While scanning the information space, researchers typically adopt a critical stance trying to identify knowledge needs or sites where knowledge is currently developing and look for opportunities to apply different approaches in hopes of realising new ways of seeing or understanding and thereby develop a niche or 'fill a gap'.

Table 7: Characteristics of Knowledge Base Construction

Characteristics	Description
Using information is experienced as...	critically analysing information sources
Research activity is experienced as...	developing an understanding or appreciation of research interests within the field

4.6 Knowledge Creation and Innovation

Researchers' experiences that align with the Knowledge Creation category are focused on *using information to create new knowledge* (see Table 8 for characteristics). Researchers who experience using information in this way draw from their existing knowledge base and understanding of a research area to determine new directions for exploration, problem-solving or innovation. Information is collected and analysed with the intent of disseminating the results to advance knowledge in the field, including identifying solutions. Researchers use their intuition and creativity to provide insights into the meaning and potential impact of new research results or methodological advances to future research endeavours. Researchers may engage with select information so that potential new knowledge may be tested and verified.

Table 8: Characteristics of Knowledge Creation and Innovation

Characteristics	Description
Using information is experienced as...	creating new knowledge and innovations that illuminate the research space
Research activity is experienced as...	generating results that advance knowledge

4.7 Research Gifts

Researchers' experiences that align with the Research Gifts category are focused on *ways of using information to achieve positive social impact*. The characteristics associated with this category are outlined in Table 9. This may involve dissemination of information through publication, application of innovations, or research approaches such as action research or other empowerment-oriented practices. Social benefits guide development and implementation of research projects, including how information is collected, used, and communicated. Researchers using information in ways that align with the Research Gifts category will be informed by their professional values, the research purpose, and the research context. Having identified new knowledge, researchers will communicate aspects of that knowledge to meet the needs of identified audiences. For example, a researcher may contribute a scholarly publication that addresses the interests of a research community or share creation of a vaccine to address a global pandemic.

Table 9: Characteristics of Research Gifts

Characteristics	Description
Using information is experienced as...	using research information for positive social impact
Research activity is experienced as...	conducting and disseminating or applying research for positive social benefits

5. Applying informed research

Stories have the ability to present the specific and highlight the transferable through situated contexts that reveal relevant and meaningful insights (Clandinin, 2016). A type of story, called an 'informing narrative,' is shared to illustrate the application of the Faces of Informed Research within collaborative research environments. Drawn from lived experiences but enacted in a fictional narrative, the informing narrative highlights how intentional use of the 'faces' can facilitate the adoption of shared perspectives that enable and enhance collaborative research outcomes.

The story presented in this section reveals how the Faces of Informed Research may be applied in a context to enable researchers to experience using information to conduct research in new ways. The story is loosely based on the experiences of one of the authors. It centres on a partnership between two universities in different countries looking to develop interdisciplinary research collaborations and mutual research capacity with support from external funders. Aligned with the Informed Learning Design model that describes how teachers may create variations that enable students to become aware of new ways of using information in learning contexts (Maybee et al., 2019), the story exemplifies how the Faces of Informed Research may be used to create variations that allow researchers to become aware of new ways to experience using information to advance collaborative research.

5.1 Informed research in context: An informed narrative

As the facilitators of this undertaking conducted initial online meetings to explore options, different experiences with using information to conduct research surfaced. Our fictitious facilitator employed the Faces of Informed Research to determine project members' experiences of using information for research purposes. The faces recognized by the facilitator as being experienced by researchers and other facilitators in this context are described below. Varying aspects of the 'faces' described in the Faces of Informed Research, she enabled members of the group to become more aware of one another's experiences, which allowed them to advance their collaborative research enterprises.

The facilitator described in this story was from 'HiTec' University, which has a well-funded library of online collections and e-research services, as well as high performance computing and information technology infrastructure. The other university involved in the partnership was 'Presence' University. Presence enjoys strong community engagement which ensured ready access to community leaders, and unique collections of heritage artefacts and specialized industry and government data sources. Administrators at both HiTec and Presence recognized an opportunity to develop research projects that could benefit researchers from both universities. Organized by the facilitator, a working group comprised of researchers from both universities was constituted to explore mutual interests and opportunities to engage in collaborative research.

Drawing from her knowledge of the **Field Awareness and Communication** category, the facilitator realised that the participants were focused on topical areas and research methodologies conducted by colleagues at their own university but had little awareness of the research areas that were the focus of the researchers at the partnering university. To extend researchers' awareness of their partners' research, the facilitator held online networking meetings in which participants shared their current research. At first, the facilitator found that participants in these discussions needed to develop a shared nomenclature for terms like 'faculty' or 'college' and 'program' or 'course,' and even for the names of reference management software used at the different universities. However, once these barriers were bridged, the facilitator shifted the focus of the discussion to vary differences and similarities between using information to conduct research at the two universities. To accomplish this, she asked

participants to identify research trends and methodological approaches within their own university as well as across the two universities. Developing a deeper awareness of the research being conducted and published by the entire group allowed the researchers in the project to collaboratively determine potential research areas that would align with the interests of both universities.

The facilitator discerned that several researchers from both universities experienced using information to conduct research in ways that aligned with the **Knowledge Base Construction** category. The shared focus on critically analysing information to understand a topic from different perspectives enabled the researchers to enrich their collective approach to the collaborative project. One instance originated when a researcher from HiTec, Jamie, described a specific methodology, which was followed by conversations with other researchers new to the method. As Jamie explained how the data analysis would be approached to Adriana, a researcher from Presence, they engaged in a discussion of the cultural sensitivities of participants that were routinely managed by Adriana, an issue unfamiliar to Jamie. They considered the language used in the thematic headings Jamie proposed and the interpretation of certain phrases in the data. The opportunity to apply local expertise that could support nuanced interpretation of data in context was a new possibility for some of the HiTec researchers, while using software that could automate effective deep data analysis across the data set was novel for many Presence researchers. Aligning with the **Knowledge Creation and Innovation** category, the researchers recognized that a methodological approach encompassing their differing ideas would likely result in new insights into both the method and the data.

As the research project partnership progressed, considerable variation among the researchers' methods and disciplinary perspectives brought up logistical concerns about the management and storage of information and how and by whom it would be accessed. Some of the researchers from both universities adhered to existing processes to guide how they used information when conducting their research (Information Processes), which they expected their colleagues would benefit from following as well. Other researchers in the group focused on determining the best ways to store and organise information (Information Organization) within the collaborative context of the current project. The facilitator used the project proposal phase and the ethics application to help the group become aware of different ways participants may be experiencing this phase of the collaborative work. Again, she began by having participants describe their own approaches to managing and storing research information. After being introduced to various approaches, the facilitator asked the group to determine the characteristics of information management and storage that would work best for the project and research team.

Several of the researchers from HiTec wanted to use a cloud solution for sharing information and resources. The researchers from Presence were unfamiliar with these technologies and did not have ready access to the preferred cloud solution. HiTec gave Presence access to the cloud solution; however, limited internet bandwidth and software configuration issues created barriers and other challenges. Drawing from the Information Organization category, the facilitator asked the research team to identify the characteristics of options that would ensure that the entire research team had sufficient access to relevant information to contribute their research expertise to the project. From these characteristics, the group then developed solutions for managing and storing information among participants of the group and sharing it with the broader community. Solutions included the adoption of a social media platform that was easily accessible by researchers from both universities. The platform allowed simultaneous information access that increased the potential for interactivity between members of the team.

Towards the end of the project, the facilitator drew from the **Research Gifts** category to lead a group discussion about the positive social impact researchers hoped their collaborative

research would achieve. While there was variation in how researchers conceptualised 'impact' for their research, most of the researchers mentioned publishing in academic venues with high citation indexes. In comparison, others emphasized how the research may benefit the target community that had participated in the study and potentially other communities like it around the world. Many HiTec researchers shared that it was quite usual for them to reach out across a range of media to share their research findings virtually. Some of the Presence researchers offered that they typically host a celebration ceremony in which they present results of projects with communities that were the focus of the research. The ensuing discussion led to researchers in the project expanding their intentions for using information in research to advance both scholarly and community interests.

An outcome of this discussion was the research team agreement to host a final site visit in which the researchers from HiTec travelled to Presence to share and celebrate the findings of the research. The funding organization of the project was invited to send a representative or join the celebration online. They created social media feeds and online blogs to help herald the upcoming release of the findings in key journals and professional association websites. Communicated during the celebration, the impact of findings on the community drew great interest from other researchers and funders.

6. Discussion

Fulfilling the aim of the conceptual exploration undertaken in this project, the Faces of Informed Research supports the development of collaborative research by enabling stakeholders to recognise how their partners may experience using information while engaged in research. When made explicit, the complementary and interconnected faces may play a meaningful role in deepening professional and research networking and to enhance and realize collaborative research goals. Specifically, this recognition allows researchers to identify which of the faces - 1) Field Awareness and Communication, 2) Information Sources, 3) Information Processes, 4) Information Organization, 5) Knowledge Base Construction, 6) Knowledge Creation, and 7) Research Gifts - one or more fellow collaborators may be experiencing and relate that face to their own experience of using information.

Using the faces to recognise experiences of using information to conduct research may allow researchers to change or expand their experiences by becoming aware of new aspects of using information when working on a collaborative research project. This type of learning might occur incidentally, such as when a researcher explains a methodological approach to a colleague that enables that person to become aware of new theoretical approaches for examining and understanding data. Someone experiencing **Field Awareness and Communication** may be focused on building their communications networks. However, researchers experiencing **Field Awareness and Communication** may not be aware of critically analysing information to understand a topic as they would be if they experienced using information to conduct research as **Knowledge Base Construction**. Through collaboration, researchers can become aware of aspects of critically analysing information to understand a topic and come to experience using information within a research context in a way that aligns with the **Knowledge Base Construction**, as well as **Field Awareness and Communication**.

The Faces of Informed Research may also be used pedagogically to deliberately enable researchers to expand their awareness of how using information may be experienced when engaged in research. It is this application of the framework that holds the most promise for supporting the development of successful collaborative research—even across wide cultural divides and amidst significant disciplinary differences—by amplifying shared experiences of using information to conduct research. In a collaborative research environment, changing researchers' experiences may result from intentional interventions by a facilitator or other member of the group who purposefully varies differences to encourage researchers to see new

aspects of using information within the research context. Enabling such changes was exemplified in the narrative when the facilitator recognized that some researchers were having different experiences of using information related to managing and storing their data. By inviting the group to work together to determine the characteristics of information management and storage that would work best for project, the facilitator enabled the entire group to develop an awareness of aspects related to the **Information Organization** category.

The informed narrative exemplified how the Faces of Informed Research may be applied in a research context. Having revisited the Seven Faces of Informed Learning (Bruce, 2008) with the aim of highlighting how researchers experience using information as part of research, the authors purposefully chose to explore how the Informed Research framework may support actual collaborative research projects. Contributing an understanding of the various experiences of using information to conduct research, the Faces of Informed Research may also inform the development of educational offerings to advance the research practices of higher education students. Applied to the development of higher education curricula focused on using information to learn (Maybee, 2018; Ranger, 2018), the Informed Learning Design model (Maybee, et al., 2019) could be honed to support the development of educational offerings specifically designed to create variations that enable students to become aware of new ways of experiencing using information within a research context.

An area of future exploration, the use of Informed Research in higher education would support collaborative research by creating a pipeline, from student to early career to experienced researcher, capable of recognising different experiences of using information within a research context and working toward shared understandings. As advisor experiences and pedagogies gain greater attention (Bruce & Stoodley, 2013; Forrester, 2021), the application of the Faces of Informed Research can be articulated and explored as a lens to enhance research experience and culture.

7. Conclusion

The Faces of Informed Research provides conceptual insights to advance research by enabling researchers to build mutual understanding of ways of using information that supports collaboration (Bruce, 2008; Gasson et al., 2020). The current exploration is limited to conceptual theorisation to identify qualitatively different experiences that researchers have of using information to conduct research. This contribution to the literature further explains how such experiences can be used in collaborative practice settings to support research development. The examination of the application of the Faces of Informed Research in additional contexts may reveal deeper and richer insights into the efficacy of Informed Research principles and practices.

Recognising that solutions to global problems increasingly require collaborative international research teams that must negotiate both national and disciplinary conventions and assumptions, future work will focus more deeply on Informed Research as part of Collaborative Capacity, a component of the Collaborative Research Culture Framework (Gasson et al., 2020). In addition to exploring educational applications, specific areas of interest for future investigation focus on the role of Informed Research in relationship to other areas of study, including group collaboration 'efficacy' (Rajalo & Vadi, 2017), leadership in research, research management and research collaboration (Browning et al., 2017; Kok & McDonald, 2017) and the importance of information experiences for successful research, collaboration and writing (Bruce, 2008; Somerville et al., 2020). This line of inquiry is timely, given exponential increase in information generation and information sources within a dynamic scholarly communication space amidst unprecedented worldwide dilemmas and global needs.

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