

# Lines-of-Inquiry and Sources of Evidence in Work-Based Research

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*There is synergy between the investigative practices of police detectives and social scientists, including work-based researchers. They both develop lines-of-inquiry and draw on multiple sources of evidence in order to make inferences about people, trends and phenomena. However, the principles associated with lines-of-inquiry and sources of evidence have not so far been examined in relation to work-based research methods, which are often unexplored or ill-defined in the published literature. We explore this gap by examining the various direct and indirect lines-of-inquiry and the main sources of primary and secondary evidence used in work-based research, which is especially relevant because some work-based researchers are also police detectives. Clearer understanding of these intersections will be useful in emerging professional contexts where the work-based researcher, the detective, and the social scientist cohere in the one person and their research project. The case we examined was a Professional Studies programme at a university in Australia, which has many police detectives doing work-based research, and from their experience we conclude there is synergy between work-based research and lines of enquiry.*

*Specifically, in the context of research methods, we identify seven sources of evidence: 1) creative, unstructured, and semi-structured interviews; 2) structured interviews; 3) consensus group methods; 4) surveys; 5) documentation and archives; 6) direct observations and participant observations; and 7) physical or cultural artefacts, and show their methodological features related to data and method type, reliability, validity, and types of analysis, along with their respective advantages and disadvantages. This study thereby unpacks and isolates those characteristics of work-based research which are relevant to a growing body of literature related to the messy, co-produced and wicked problems of private companies, government agencies, and non-government organisations and the research methods used to investigate them.*

**Key words:** Line-of-inquiry, evidence, research methods, police detectives, work-based research

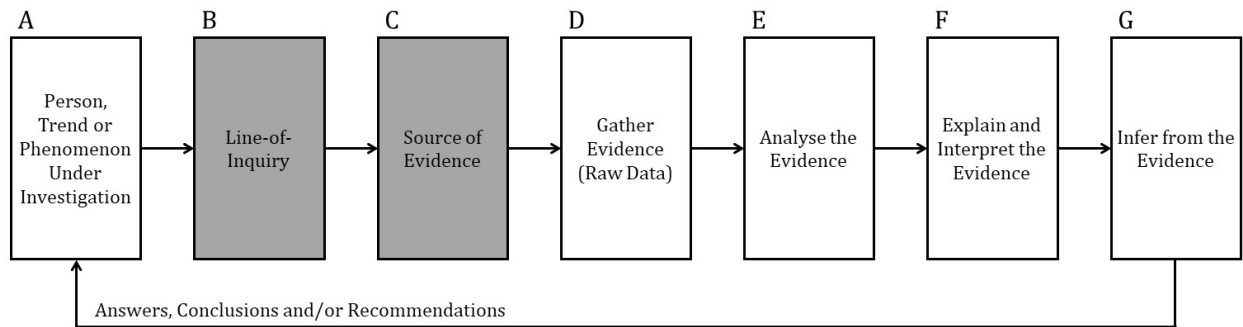
## Introduction

Forty years ago, Zinnes (1980: 319) coined the term “researchers qua detectives” (researchers as well as detectives). Since then, the parallels between the investigative work of detective police officers in solving crime and social scientists in addressing and seeking to understand human and organizational behaviour have been further noted in the literature. Winks for example equated the method of a historian to a detective (1969) and the method of a detective to a historian (2013), noting that being a historian is “like being a detective”: in trying to “make sense of a series of events...[the historian must] speculate on a number of different causal relationships, search for as much evidence as possible, and then eliminate all the hypotheses that were contradicted by the facts, leaving, ideally, the one hypothesis that must be true” (Winks, 2013: 97). An important precursor to that association had come earlier in 1951 with the acclaimed work of fiction *The Daughter of Time* by Josephine Tey, in which a modern police detective painstakingly reconstructed a case for the innocence of Richard III (d. 1485); her character’s logical deductions, sifting of evidence, analytic reasoning and use of method testify to a synthesis of history and detection that Winks would later articulate.

Kaminsky, Rosenqvist and Holmstro (2009: 385) correspondingly likened the assessment phase of nursing to a “detective’s work...asking questions and listening carefully...search[ing] for clues”, and Smith, Braunack-Mayer, Wittert and Warin (2008: 3) associated the self-monitoring of men’s health with “sort of like being a detective”. It has been argued, therefore, that what makes a good detective also makes a good researcher, with success in each investigative method (including the application of skills such as pattern recognition [Dror & Cole, 2010]) reliant on an unbiased, systematic, and methodical approach to evidence in order to uncover facts or the ‘truth’. As Sherlock Holmes famously declared: “Data! Data! Data!...I can’t make bricks without clay” (Konnikova, 2011).

This research paper concerns itself with two interrelated investigative concepts common to both work-based researchers and police detectives: 1) line-of-inquiry; and 2) evidence gathering. However, we acknowledge of course that not all work-based inquiry is identical to the work of detectives but use detective work to highlight the use of our two concepts. We also recognize that not all work-based research applies the concepts in identical ways to each other or as they are described herein. However, the relationship between a line-of-inquiry and evidence to the general conduct of research can be schematically represented by Figure 1.

In this regard, Yin (2016: 108) has stated that “an apt analogy is to the clinical queries made by medical doctors. In asking about ailments that patients might have difficulty describing, the doctors will converse casually with their patients, but the doctors are also following an established line of inquiry to check the symptoms [i.e., the evidence]. While asking their questions, the doctors are entertaining the possible ailments that might be relevant”. Like the medical doctor who wishes to establish the underlying cause of a symptom in Yin’s (2016) example, a researcher investigates a person, trend or phenomenon (A), and develops a line-of-inquiry, i.e., a ‘line of questioning’ or a ‘line-of-argument’ (B) associated with the topic of investigation. The researcher gathers evidence (i.e., raw data) (D) from different sources of evidence (C) and, on gathering the evidence, analyses (E), explains and interprets (F), and then draws tentative conclusions or inferences from the evidence (G) in order to better understand or reveal the ‘truth’ (i.e., to provide answers, conclusions and/or recommendations) about the person, event or phenomenon (A) under investigation.



**Figure 1:** The relationship of line-of-inquiry and source of evidence to the investigative process. The scientific nature of this process has been long recognised in professional literature (Perkins, 1949: 10). In policing, Berg (1999: 139) described the process represented in Figure 1 as “a scientific and systematic series of activities designed to use various pieces of information and evidence to explain the events surrounding a crime, identify a suspect, and link that suspect to the crime. In this process, police and detectives use fingerprints and other evidence found at the scene of the crime, computers and other sophisticated technological and chemical advances, and logical reasoning to solve the crime”. The research steps in Figure 1 can be identified in Berg’s analysis of police detection, with “a crime” corresponding to (A), “fingerprints and other evidence” corresponding to (C), and “logical reasoning” corresponding specifically to (F-G) but also to the entire sequence of steps presented in Figure 1. In Yin’s example, the doctor might ask (qualitative) questions about symptoms (A) and follow a line-of-inquiry (B), but she might also recommend other (quantitative) blood tests or an X-ray (C) to isolate and analyse data (D-E) to help explain the cause of symptoms (i.e., the ailment) (F), on the basis of which tentative conclusions can be drawn (G) about how best to effectively treat the underlying health problem (A). Figure 1 thereby locates the fundamental roles lines-of-inquiry and sources of evidence play in successful investigative outcomes.

Moreover, in the same way that bias can affect the dependability and trustworthiness of qualitative research findings and conclusions, the possibility of bias based on several possible causes, including race, is recognised in the literature (Dempsey & Frost, 2007: 215). As such “biased decision-making in criminal investigations can impede or arrest the progress of justice” (Fahsing & Ask, 2016: 203). Thus, for the detective-researcher, issues like investigator bias, stereotyping, selectivity of evidence, presence and potential impacts of compounding variables, threats to reliability and validity of method, inadequate or inappropriate analytical techniques, emergence of rival hypotheses, and making false assumptions or generalizations are relevant to both policing and research in the methodical approach suggested by steps A > G in Figure 1.

The police interview and the qualitative research interview can be sites of bias and must be protected against it. Strathern (2014: 261) refers to the ‘scrutability of questions’ and the strength of data elicited as safeguards in both sites. For example, in the context of policing and the “human tendency towards selective information search and confirmation bias”, Fahsing and Ask (2016: 204) have explained the role of abductive logic in developing a line-of-inquiry and its relation to scientific discovery based on evidence. They note that when “transferred to an investigative context, the preference for such ‘positive testing strategies’ [i.e., selective information searching] entails serious implications. Specifically, there is an obvious risk that investigative actions become too focused on finding incriminating (i.e., confirming) evidence against a prime suspect, while no efforts are made to find potentially exonerating (i.e.,

disconfirming) information". In such instances, an adversarial criminal trial in which defense counsel probes and challenges can bring such one-sided cases undone.

Positive testing strategies can also prove disastrous in medicine and other diagnostic sites, which routinely face challenges associated with false negative and false positive diagnoses as well as placebo and nocebo effects. And while the literature associated with 'evidence-based policing' and its relation to the work of a detective is still emerging (e.g., Kalyal, 2019; Telep & Somers, 2019), our goal is to examine the specific characteristics of lines-of-inquiry and sources of evidence in the methodological approaches of work-based research because the relationship between these has yet to be explained. Consideration of the synergies between the practices of police detectives engaged in their work and academic researchers engaged in theirs will be brought together with examples from work-based learning projects undertaken by senior police officers. In this way, any boundary between the academic and the detective becomes uncertain and the detective-as-researcher comes more firmly into view.

In the last 20 years, a number of important pedagogies related to learning and research at 'work' have been advanced. Situated in the world of work more generally, these pedagogies have collectively been referred to under the umbrella term 'work-related learning' (e.g., Allan, 2015), and include approaches such as work-integrated learning (e.g., Jackson, 2015), workplace learning (e.g., Gherardi, 2009), work-applied learning (e.g., Wall, 2017), work-based education (e.g., Zanibbi, Munby, Hutchinson, Versnel, & Chin, 2006), and, importantly for the present study, work-based learning (e.g., Helyer, 2015). For our purposes, we use the term work-based learning (WBL) to mean a transdisciplinary field of learning which "logically refers to all and any learning that is situated in the workplace or arises directly out of *workplace concerns*" (Lester & Costley, 2010: 562), with our emphasis deliberately placed on workplace problems and their solutions. Thus, in WBL the researching practitioner is "concerned with the most compelling and effective real-world 'maps' of *situations* and *phenomena* rather than with either purely theoretical or pragmatically simplified representations" (Costley & Lester, 2012: 259).

Such a conceptualisation can be contrasted to the more common (and generic) concept of workplace learning (WPL), which has so far focused on "retrospective experiential learning" (Fulton & Hayes, 2017) and "professional practice" (Fulton, Kuit, Sanders, & Smith, 2012) rather than work-based problems *per se*. Cacciattolo (2015: 243) for example points out that because "working is interconnected with learning...workplace learning is the way in which skills are upgraded and knowledge is acquired at the place of work", but she fails to mention the all-important wicked, messy and co-produced situations, problems, challenges, and other phenomena of work (e.g., Dostal, Cloete, & Járos, 2005; Fergusson, 2019; Head & Alford, 2015) and the associated investigative methods used to examine them when defining the mission of WBL. These types of problems have been associated with private organisations, government agencies, and non-government organisations.

Precise descriptions about the specific research methods used in WBL have only recently been made. Fergusson, Shallies and Meijer (2019) have identified the centrality of models, methodic-ness, and mixed methods in WBL and their relation to first principles of scientific inquiry, but Costley and Abukari (2015: 11) have noted "the links between practitioner research and research methodologies need further development as this is a key area for practitioners to enhance their working practices especially at postgraduate and doctorate level". Costely and Abukari go on to point out that "research approaches and methodologies have been an important development in universities [and] qualitative research has been at the forefront of these initiatives [but] work-based research projects are not an applied version of

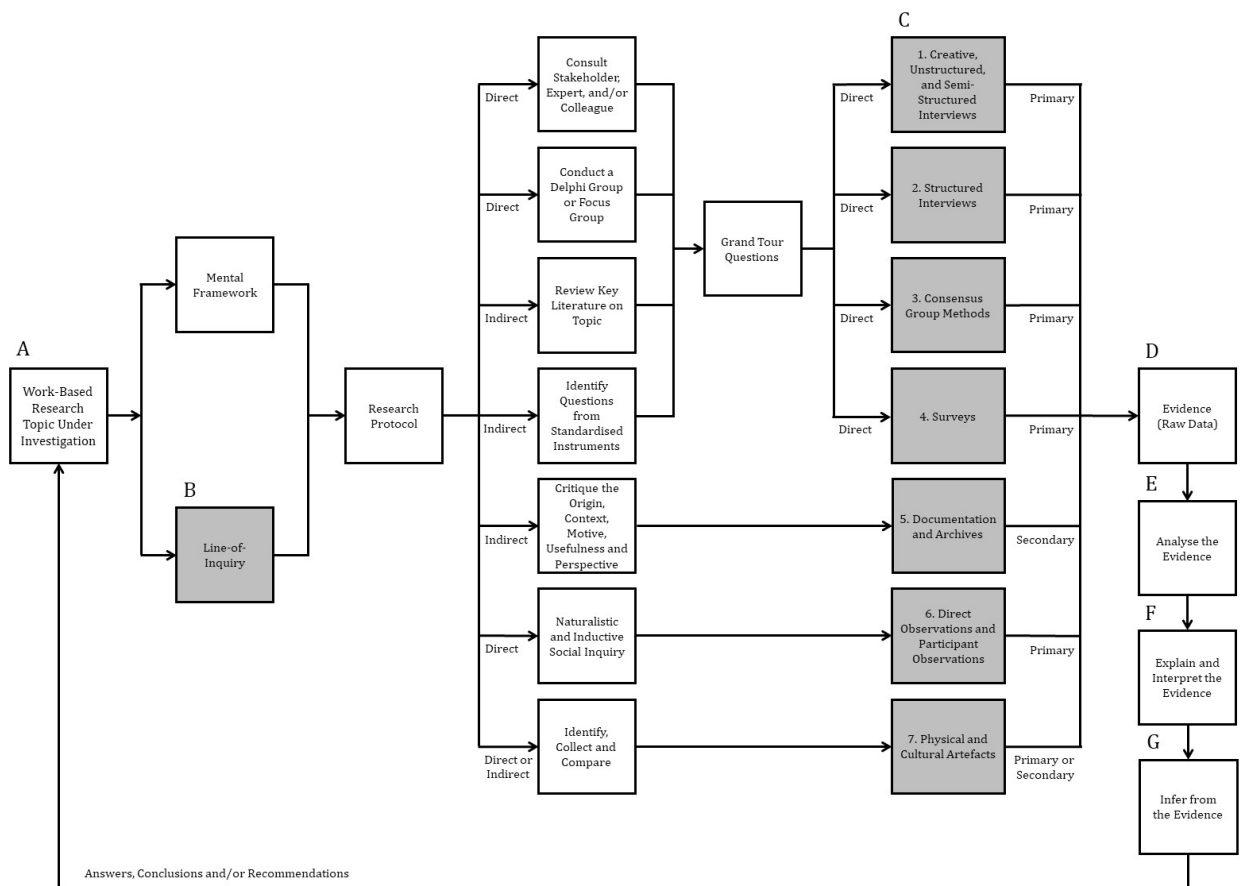
an existing theory” and hence further investigation of work-based research methods is warranted.

To achieve our goal of identifying the role of lines-of-inquiry and sources of evidence in work-based research, we have identified the nexus of this study as the WBL and research-based pedagogy conceived and operationalised from within a University in Australia, with which we are most familiar. This higher degree by research (HDR) approach to investigating work is called ‘Professional Studies’ (Fergusson, Allred & Dux, 2018; Fergusson, Allred, Dux & Muianga, 2018; Fergusson, van der Laan, White, & Balfour, 2019). At the heart of all WBL pedagogies is reflective practice (e.g., Fergusson, van der Laan & Baker, 2019; Helyer, 2015), but Professional Studies also features student-centric learning built around personal and programme learning objectives and a mixed methods approach to researching pragmatic, work-based wicked problems (Mertens, 2015). Using the postgraduate Professional Studies programme at USQ as the context for study is particularly appropriate as some of the researching practitioners within this HDR programme are senior police officers and plain-clothes detectives. The question we ask, therefore, is: how are lines-of-inquiry and sources of evidence conceived and applied in work-based research? We approach this task by using descriptive analyses of white and grey literature from within the Professional Studies programme and an Australian Police Service, drawing from the authors’ collective experience with both police detection and WBL research practices.

### **Lines-of-inquiry**

Given the close association of investigative policing and research, lines-of-inquiry form a central part of both police detection (Fahsing & Ask, 2016) and social science research (Yin, 2016), but sometimes also play a role in medical research (e.g., List, & Gallet, 2001), education (Nordness, Swain, & Haverkost, 2012), law (van Oorschot, & Mascini, 2018) and engineering (Chinowsky (2011)). An expanded form of the research process presented in Figure 1 can be seen in Figure 2, in which a line-of-inquiry and sources of evidence have been highlighted and labelled (B) and (C).

Once the topic of investigation, problem, theory, and research question (RQ) have been identified (A), the researcher, according to this model, develops a mental framework and a line-of-inquiry (B). Together these two preliminary approaches (one psychologically tacit and the other overt) run in parallel for the purposes of developing a research protocol.



**Figure 2:** Relationship of direct and indirect lines-of-inquiry to sources of primary and secondary evidence in work-based research.

A mental framework, sometimes called an ‘investigative hypothesis’, is an adjunct to the line-of-inquiry. As suggested by attribution to the realm of the mental (or even imaginative), a researcher or police investigator’s inner emotional and intellectual worlds are part of this framework. The rational ‘hunch’ can be both ‘visceral’ and a reasoned response based on experience (George Mason School of Law, 2007: 83). Akin to his earlier analogy of the doctor, Yin (2016: 109) maintains that when solving crimes, a police detective investigates “at two levels”:

The first involves collecting evidence [i.e., data collection on the basis of a line-of-inquiry], whereas the second involves simultaneously entertaining their own ideas about how and why a crime might have occurred. The questions lead to the detectives’ hunches and theories about crime and may direct their attention to new evidence whose significance might first have gone unappreciated. The hunches and theories may be considered the detectives’ mental framework.

According to Fahsing and Ask (2016: 218), like researchers in Yin’s examples, detectives have an “ability to identify relevant investigative hypotheses and formulate appropriate lines of inquiry”, and once a line-of-inquiry has been identified, the detective-researcher decides on the appropriate approach to gathering evidence, i.e., Data! Data! Data! or (D) in Figure 2, and plans how to conduct the search. This stage of investigation involves the development of a research protocol, which consists of the aims and objectives required to answer the investigative question(s): what is it I wish to know, and how am I going to go about knowing it?

Thus, the protocol reflects a broad research line-of-inquiry accompanied by a mental framework, both of which are associated with the research topic, theme, or construct under investigation (A).

As shown in Figure 2, in work-based research the research protocol can take a number of forms depending on the type of evidence to be examined. In the case of interviews, consensus group methods, and surveys, four authoritative sources may be used to inform and guide questioning. In the case of work-based research, the research protocol may necessitate consulting stakeholders, experts or colleagues from the same work-base or practice domain who come together to brainstorm about what questions are likely to elicit the responses needed to understand the research topic, or could involve convening a focus group or Delphi group of experts for the same purpose. Similarly, the researcher could identify relevant questions from the published literature which relate to and extend knowledge about the research topic or could re-use questions previously posed by other researchers or questions derived from standardised test instruments which have yielded valuable data on the topic in the past.

In all cases, these authoritative sources form the basis of inquiry because the practice results in the generation of 'grand tour' questions, i.e., questions the researcher needs in place in the right order to extract data required to answer (or at least partially answer) the overarching research question(s) related to the investigation (Leech, 2002). Grand tour questions serve as the formal architecture of the interview or survey process, cover the main topics of the interview or survey, form the basis of follow-up questions on more specific aspects of the research topic, and may represent the lead-off questions in an individual or group interview or survey. Thus, the line-of-inquiry (B) and mental framework are operationalised through the research protocol in order to define the various kinds of information to be elicited from the interview, consensus group, or survey (C). In this approach, the interviewee, group or survey respondent can also be considered a 'source of evidence'.

Other sources of evidence may also be investigated, including organisational or policy documents and archives. These text-based sources again bring together the detective and the historian. Both will read the textual content through a discursive lens, seeking not only content from the dead letter on the page but the deeper meaning and emphases beneath the surface and between the lines. Sometimes what is *not* said or what has been omitted can be as meaningful as what is included and archival silences are revealing (Guberek & Hedstrom, 2017). In using these sources, the research protocol requires a critique of the origin, context, motive, usefulness and perspective of the document's original author(s), whether the sources are a continuous running record or discontinuous record, direct and/or participant observations for which naturalistic and inductive social inquiry are required, and/or physical and cultural artefacts which require a protocol of identification, collecting and comparing during interrogation. Archives also provide traces of human behaviour (Canter & Alison, 2003: 162). In the case of police detection, physical artefacts may also be forensically examined.

According to Chinowsky (2011: 3), the "formalization of a line of inquiry requires three elements: a foundational definition, an operational context and a path forward to guide researchers within the domain"; in policing and social science research, this "path forward" results in the formation of either direct or indirect lines-of-inquiry, both of which can be effective. A direct line-of-inquiry refers to evidence gathering which yields data to support the 'truth' of an assertion directly without an intervening inference, whereas an indirect line-of-inquiry refers to evidence which establishes collateral facts from which the main fact may be inferred, such as circumstantial or supporting evidence. In policing, Berg (1999: 163) points out that a detective uses an indirect line-of-inquiry "in an attempt to draw out the truth without

specifically addressing the literal facts or circumstances of the case....It is a little like sneaking up on the truth, rather than coming out immediately and asking [about it]. It is also a non-accusatory style of questioning". In contrast, direct lines-of-inquiry, according to Berg, "work best with experienced criminals", and involve coming straight to the point of the inquiry. However, in Berg's example, both indirect and direct lines-of-inquiry use the same source of evidence (i.e., a suspect, but presumably could also apply to a witness).

As shown in Figure 2, direct or indirect lines-of-inquiry in work-based research are applied differently from each other. For example, in developing grand tour questions in research, consulting stakeholders and others as well as conducting consensus group methods to gain insight into the topic are direct lines-of-inquiry, whereas reviewing literature and standardised instruments are indirect lines-of-inquiry, allowing the researcher in Berg's conception to "sneak up on the truth". Moreover, all four sources of evidence associated with the development of grand tour questions and direct and participant observations are direct lines-of-inquiry, while documentation and archives analyses are considered indirect lines-of-inquiry (because they are not directly related to the main phenomenon under investigation and are usually of a secondary or inferential nature) and use of physical and cultural artefacts can reflect either a direct or indirect line-of-inquiry because the evidence may directly assert 'truth' or may be circumstantial in nature. The output from these direct and indirect approaches is evidence or raw data (D), which need to be analysed (E), the results of which require explanations, including considerations of cause (i.e., explanans) and effect (i.e., explanandum) and craft rival and real-world rival hypotheses (Yin, 2016: 173), and interpretations (i.e., consideration of relevance and importance of the finding) (F), from which sound inferences can be made (G).

Consider the following example of a line-of-inquiry (B) and its relation a source of evidence (C) from a current policing Professional Studies work-based research project embedded within the QPS. Having identified a significant gap in training, the research topic considers how to develop and implement an effective training programme for police investigators (A) by asking: What comprises an Investigative Coordinator's Course for Senior Investigators of the rank of Detective Sergeant and Detective Senior Sergeant and how might it be implemented? Two main lines-of-inquiry (B) were then identified: 1) whether current training programmes adequately address the knowledge, skills and experience required of a detective (direct and indirect lines-of-inquiry); and 2) emerging investigative strategies required of a detective (direct line-of-inquiry).

By interviewing stakeholders and colleagues and by interrogating through that discursive lens policy and training documents for what is said but also what may be omitted or absent, the researcher can assess current-state training 1) and by interviewing and conducting a focus group with stakeholders and colleagues, the researcher can gather evidence related to future-state training 2). These lines-of-inquiry and subsequent evidence (D) can be analysed (E), explained and interpreted (F), and thereby used to understand current-state and infer future-state training needs for senior police investigators (G). In this example, work-based research would then lead to an actual workplace project by providing the evidence necessary to develop and implement a revised or new Investigative Coordinator's Course, which can be assessed and evaluated on the basis of evidence, thereby fulfilling the requirements of (A).

### **Sources of evidence**

Choosing the right source of evidence (C) is fully dependent on the problem to be addressed and RQ to be answered (A) and the appropriate line-of-inquiry adopted by the researcher to answer it (B). For example, in the work-based case cited above, it appears entirely appropriate



that the researcher directly elicit the opinions of stakeholders and colleagues and indirectly analyse policy documents in order to answer the RQ rather than examine physical and cultural artefacts.

It is not within the scope of this paper to identify and explain all the sources of evidence available to a researcher when examining work-based phenomena. We have therefore identified the seven main sources of evidence which in the literature and through experience within the Professional Studies programme have been associated with work-based research. These sources are: 1) creative, unstructured, and semi-structured interviews; 2) structured interviews; 3) consensus group methods; 4) surveys; 5) documentation and archives; 6) direct observations and participant observations; and 7) physical or cultural artefacts, shown as (C) in Figure 2 and discussed in more detail below.

**1. Creative, Unstructured, and Semi-Structured Interviews.** As a source of evidence, short- and long-form interviews are a core technique in work-based research. Several variations of non-structured interviews have been identified, including ethical integrity, life history, situational, patterned behaviour description, creative, unstructured, and semi-structured, of which the last three types will be highlighted.

According to Mason (2010), creative interviews involve “exploration of verbal and non-verbal dimensions—material, spatial, environmental, non-human, embodied, sentient and sensory—and their intersection”. Creative interviews can be useful when the researcher wishes to learn about operational “processes, nuances, richness, meanings, experiences, dynamics, connections, and complexity” and are often associated with ‘why’ and ‘how’ research questions or nuanced understandings of ‘what’. To paraphrase Mason (2010), researchers who are interested in actors’ perspectives and experiences, in situational and embodied knowledge, knowledge which is contextual and particular, and knowledge as constructed and created not simply collected, find creative interviews of value. As a result, creative interviews result in an understanding of processes ‘in the round’ rather than the logic of theoretical constructs but are based on a line-of-inquiry and research protocol.

Unstructured interviews (Zhang, & Wildemuth, 2009), sometimes called ‘discovery interviews’ or ‘non-directive interviews’, are also exploratory in nature and may occur with or without the researcher devising questions prior to the interview (i.e., will use an implicit line-of-inquiry and research protocol but may not use grand tour questions). Being conversationally based on the interviewee’s responses, unstructured interviews proceed like a friendly, non-threatening conversation because each interviewee is asked a different series of questions depending on where the conversation leads. Hence, it is the interviewee who decides what is and is not important in an unstructured interview.

In policing, these types of interviews are referred to as ‘cognitive interviews’ (Fisher, Milne, & Bull, 2011) and have been found most effective when interviewing cooperative witnesses, victims or suspects. This method focuses on the interviewee and their narrative and locates the interviewee as the active party in the interview process, a process designed around the so-called PEACE model (Brooks, Snook, & Bull, 2015). In simple terms, the interviewee knows why s/he is being interviewed and is afforded the opportunity to provide all the information s/he sees as relevant via an uninterrupted narrative. Contextual reinstatement is encouraged where the interviewee recalls the incident (often chronologically, in a before, during and after format).

Police investigators are taught that this is the best way to obtain a more thorough, reliable and accurate account of a crime rather than using a Q&A format. After the free narrative, questioning can (and often does) continue with the interviewer identifying specific topics to probe and discuss. Thus, cognitive interviews are described as being like a funnel,

with open questions at the top and direct, closed questions at the bottom, with questioning progressing from open to closed if and as required. As well as witness/victim versions and suspects admitting offences, the method is also useful for suspects denying allegations. For example, if a robbery happened yesterday and the suspect denies the offence, a cognitive interview of their movements and interactions yesterday will provide details investigators can use to corroborate or disprove the suspect's version of events as opposed to a simple (and closed-ended) denial.

The most common interview in work-based research is semi-structured (Kallio, Pietilä, Johnson, & Kangasniemi, 2016). Semi-structured interviews form the dominant type in both qualitative and mixed methods research. In this approach, the relationship between interviewer and interviewee is a social one and the interview is not tightly scripted but open-ended; the researcher has an explicit line-of-inquiry and follows a research protocol and grand tour, but the questions posed may differ according to the context and setting of each interviewee. Being open-ended, questions are deemed important but are also designed to elicit responses which do not pre-empt the interviewee or beg the question and encourage use of their own words. Semi-structured interviews thus seek out the details of experience and ask interviewees to reconstruct and explain their experience in their own words. Thus, researchers using semi-structured techniques seek to understand the interviewee's world, including understanding the meaning of their words and phrases. In research of gender and diversity in Australian Federal policing, an example of an unstructured question would be: tell me about your experience as a police officer, but a semi-structured one would be: what are your views about female police officers and their role in the Australian Federal Police?

Some quantitative researchers maintain these three approaches lack the reliability and precision of a structured interview, while qualitative researchers maintain the comparison is a meaningless one because data from unstructured interviews are not designed to be generalisable but can still be trustworthy.

**2. Structured Interviews.** We have separated structured interviews from the preceding three types because they are confirmatory in nature, typically use categorical questions, and are mostly quantitative. Structured interviews are conducted using carefully scripted, repeatable, closed-ended questions according to a proscribed list of grand tour questions (Rowley, 2012). In structured interviews, the researcher adopts the formal role of 'interviewer' and tries to adopt a uniform behaviour and demeanour when interviewing different interviewees. Such interviews are typically part of a survey or poll and may seek to draw qualitative and/or quantitative data from a representative sample of interviewees. As a consequence, structured techniques tend to focus on core dimensions or constructs and limit responses to those dimensions or constructs that have been predefined by the researcher (i.e., questions are closed-ended and answers often single-word, sometimes only allowing categorical answers), including word usage, phrases and hence meaning. Structured interviews are therefore confirmatory in nature, and it is the interviewer who decides what is and is not important.

Data derived from such interviews are said by some researchers to yield more reliable and valid data, especially in clinical, forensic or investigative contexts, not least because they follow rigid rules and can be analysed statistically and generalised to the larger population (Craig, 2005: 38). In this sense, structured interviews can be treated quantitatively and may form the quantitative aspect of an exploratory, explanatory, concurrent, or embedded mixed method design while being supplemented with other qualitative techniques. In the study of gender and diversity in policing for example, a structured interview question would be: do you think the Australian Federal Police should employ more women? In police

interrogations, 'conversational management' is closely aligned with structured interviews and the stereotypical 'interrogation' style of interview. Such an approach is preferred when dealing with uncooperative suspects and witnesses. Conversational management is a direct interviewing technique which uses a closed-ended style that does not provide significant opportunity for the interviewee to provide a free narrative; hence, responses are a definitive yes or no. The focus of these interviews is on the interviewer's questions and the interviewee is but a passive participant.

**3. Consensus Group Methods.** Consensus group methods include focus groups, Delphi groups, and nominal groups. A focus group is a source of evidence based on data collected by the researcher from a small group of key informants having similar attributes, experience or work-based focus (Longhurst, 2003). In a focus group, the researcher leads the group discussion in a non-directed manner but using grand tour questions, with the objective of identifying the "perspectives of the people in the group with as minimal influence by the researcher as possible (Yin, 2016: 336).

In a similar way, a Delphi group allows the researcher to gather evidence from a group of experts according to the following stages: "identifying a research problem, selecting participants, developing a questionnaire of statements, conducting anonymous iterative postal or email questionnaire rounds, collecting individual and group feedback between rounds and summarizing the findings. This process is repeated until the best possible level of consensus is reached, or until a predetermined number of rounds have been completed. Participants never meet or interact directly in the classically-described Delphi method" (Humphrey-Murto, Varpio, Gonsalves, & Wood, 2017: 15), which is an intriguing parallel to correct police and legal procedure in which witnesses would not be allowed to interact. Nominal groups share several features of focus and Delphi groups, but a nominal group "is a structured *face-to-face interaction* usually involving 5-12 participants (Humphrey-Murto et al., 2017: 15).

**4. Surveys.** Using categorical, ordinal and/or ranked questions, surveys are a common source of explanatory evidence in work-based research (e.g. Lester & Costley, 2010; Swail & Kampits, 2004) because they yield inferentially analysable quantitative data said to represent larger general and working populations (Nardi, 2018). Work-based researchers use surveys when they wish to obtain or develop an understanding of the lived experiences of other people and the meaning they make of those experiences, typically as part of a larger programme of investigating organisations, workplaces, social phenomena, practice domains, and work more generally. Surveys can also explain relationships between people, and can examine how we know, learn, educate, and develop as human beings, but important questions associated with the relationship between probability and non-probability samples and between response rates to representativeness of populations using survey techniques have also been discussed (Cornesse & Bosnjak, 2018). In an embedded, mixed methods study of workplace health, safety and wellness for example, a work-based researcher in Professional Studies included a leader's 360-degree survey tool, specifically a Life Styles Inventory (LSI), to collect and distinguish responses to 240 inventory items and measure 12 thinking patterns or styles and their effectiveness.

**5. Documentation and Archives.** The examination and interrogation of documents and archives is particularly well suited to work-based research because they allow for the analysis of content created locally or collaboratively by organisations, governments and/or people in work environments. For a historian, archives comprise their 'primary sources' but in work-based research documents and archives typically supplement other primary sources of evidence, and may include memoranda, letters, diaries, administrative documents (such as proposals, progress reports or policy documents), public-use files (such as census and other

statistical data made available by state or federal governments), maps and charts, in-house commissioned survey data, formal studies or evaluations of work environments, and articles which have appeared in industry-related or mass media. As such, diversity of data rather than uniformity prevails in type, frequency and availability. For example, a recent Professional Studies' programme of research on psychological well-being, which asked: What are the current psychological support mechanisms provided to the Australian Police Officers after an officer-involved shooting, required a systematic analysis of internal documents associated with so-called 'post-incident occurrence reports'.

However, Yin (2016: 117) cautions the researcher to "be careful to ascertain the conditions under which [a document or archive was] produced, as well as its accuracy. Sometimes, the archival records can be highly quantitative, but numbers alone should not automatically be considered a sign of accuracy". Work-based research can, however, uncover an understanding of an institution's or government's social or organisational life based on what has *actually occurred* rather than on a set *a priori* assumptions about what the researcher thinks might have occurred. While it is tempting to consider an archival source as akin to an 'eye witness' or for information 'hot from the archive' to have a distinctive authority or immediacy, a further note of caution: archives and documents are fundamentally different from other sources of data. The researcher will determine how many interviews and of what type or what type of survey they will conduct; archives and documents, on the other hand, exist in types and quantities beyond the control of the researcher, can be incomplete by accident or deliberate destruction, and can be discontinuous or continuous. For example, a researcher wishing to use records to understand the longer history of Indigenous interactions with police in Australia would find the records have been lost (Richards, 2008).

**6. Direct Observations and Participant Observations.** Wildemuth (2009a, 2009b) has described the nature and relationship of direct and participant observations. In case study research, as in work-based research, Yin (2016: 121) explains that because research "takes place in the real-world setting of the case, you are creating an opportunity for direct observation. Assuming that the phenomena of interest have not been purely historical, some relevant social or environmental conditions will be available for observation. Such observations serve as yet another source [of evidence, and] can range from formal to casual data collection activities" based on a line-of-inquiry and research protocol.

Yin (2016: 122) goes on to point out that "observational evidence is often useful in providing additional information about the topic being studied...observations about the group in action can yield invaluable data to complement interviews with individual group members [or a consensus group]...observations can add new dimensions for understanding the actual uses of a new technology or of a new curriculum and any problems encountered". Such was the case for a recent Professional Studies' project which used direct observation to assess the time taken by the Australian police officers to access data via a new mobile intelligence dissemination product. Participant observations go further by allowing the researcher to participate in phenomena as a staff member or key decision maker in an organisational setting not merely being a passive observer of them. However, as noted in Table 2, this source of evidence as with all others is not without limitations.

**7. Physical and Cultural Artefacts.** Perhaps used more extensively in police investigations and forensic anthropology than in work-based research, physical and cultural artefacts can be a valuable source of evidence. Also called 'real evidence' or 'material evidence', an artefact in a work-based context can include a "technological device, a tool or instrument, a work of art, or some other physical evidence. Such artefacts may be collected or observed..." (Yin, 2016: 125) and can also be accidentally discovered. Yin (2016: 125) goes on to note that while artefacts

may have less “potential relevance” in some cases, “when relevant, the artifacts can be an important component in the overall...study”. Such is the case in a current Professional Studies’ project on the development of a new Operational Skills and Tactics (OST) facility for which a postgraduate student is required to visit Australian and international police and military training centres to gather data on construction techniques and operational designs.

The methodological features of each source of evidence are presented in Table 1. These include the type of data yielded by the source (i.e., primary or secondary data), the research method type, whether the source can be tested for reliability and validity in the case of quantitative data or assessed for dependability and trustworthiness in the case of qualitative data and thus whether generalisations may be drawn from the data, and the types of analysis generally associated with each source of evidence.

As shown by Fergusson, Shallies and Meier (2019), work-based research may embrace either quantitative, qualitative, or mixed methods approaches, and typically views phenomena through a Pragmatist or Constructivist lens. Thus, each source of evidence yields either primary data (i.e., data collected by the researcher from first-hand sources, such as an interview) or secondary data (i.e., data collected previously by someone else, such as data located in government policy documents), the researcher applies a research method which is either qualitative, quantitative or mixed methods, which yields data which are either reliable/dependable or valid/trustworthy to be analysed using a variety of different analytical techniques.

Take the case of data from a semi-structured interview. Data result from a direct line-of-inquiry with a primary source, are either gathered via a qualitative or mixed methods research approach, are dependable, trustworthy, are, to use Yin’s (2016: 37-38) phraseology, analytically generalisable but not statistically generalisable, and can be analysed using a variety of techniques, including thematic, saliency and basic content analysis. In contrast, data derived from a physical artefact might result from an indirect line-of-inquiry with a secondary source, may be gathered via a quantitative approach, may be reliable and valid depending on the characteristics of the artefact, and may be analysed using direct observation, forensic analysis and/or logical reasoning.

Qualitative and some mixed methods work-based researchers do not use instruments with established reliability and validity metrics. However, like their quantitative cousins, they too must show how their findings are credible and confirmable, and where applicable transferrable and generalisable. Like reliability in quantitative research methods, in Table 1 ‘dependability’ means the stability of data over time and over conditions, and the extent to which qualitative or mixed methods research can be repeated by others resulting in findings that are consistent (Golafshani, 2003). In naturalistic settings, work-based researchers recognise that reality is socially constructed and constantly changing, and that dependability of method originates from reliably capturing the changing conditions of the work settings; these can occur through a variety of means but include stepwise replication and inquiry audit.

**Table 1:** Sources of evidence and their methodological features.

Source of Evidence	Type of Data	Type of Method	Reliability	Validity	Type of Analysis
<b>1. Creative, Unstructured, and Semi-Structured Interviews</b>	Primary	Qualitative; mixed methods	Dependable	Trustworthy; analytically generalisable, but not statistically generalisable	Thematic; salience; basic content; interpretive content; qualitative content; discourse; dimensional, situational; categorical; or contextualising
<b>2. Structured Interviews</b>	Primary	Qualitative; quantitative; mixed methods	Reliable; dependable	Valid; trustworthy; analytically and statistically generalisable	Statistical analyses, including descriptive and inferential; thematic; salience; basic content; interpretive content; qualitative content; discourse; dimensional, situational; categorical; or contextualising
<b>3. Consensus Group Methods</b>	Primary	Qualitative; mixed methods	Dependable	Trustworthy; analytically generalisable, but not statistically generalisable	Thematic; salience; basic content; interpretive content; qualitative content; discourse; dimensional, situational; categorical; or contextualising
<b>4. Surveys</b>	Primary	Quantitative; mixed methods	Reliable	Valid; analytically and statistically generalisable	Statistical analyses, including descriptive and inferential
<b>5. Documentation and Archives</b>	Secondary	Qualitative; mixed methods	Dependable	Trustworthy; analytically generalisable, but not statistically generalisable; continuous or non-continuous; partial or complete	Thematic; salience; basic content; interpretive content; qualitative content; discourse; dimensional, situational; categorical; or contextualising
<b>6. Direct Observations and Participant Observations</b>	Primary	Qualitative; mixed methods	Dependable	Trustworthy; analytically generalisable, but not statistically generalisable	Thematic; salience; discourse; dimensional, situational; categorical; or contextualising
<b>7. Physical and Cultural Artefacts</b>	Primary or Secondary	Quantitative; qualitative; mixed methods	Reliable or dependable	Valid; trustworthy, analytically generalisable but not statistically generalisable	Direct observation; forensic analysis; logical reasoning

**Table 2:** Advantages and disadvantages of sources of evidence in work-based research.

Source of Evidence	Advantages	Disadvantages
<b>1. Creative, Unstructured, and Semi-Structured Interviews</b>	<ul style="list-style-type: none"> <li>▪ Can uncover and probe key evidence, despite lack of questions or clear line-of-inquiry</li> <li>▪ Can provide insight into, and explanations of, a phenomenon, as well as the personal opinions of participants</li> <li>▪ Non-threatening technique</li> <li>▪ Creative interviews can involve observations and explorations of verbal and non-verbal dimensions and their intersection(s)</li> <li>▪ Unstructured interviews are flexible because questions can be adapted and changed according to answers received</li> <li>▪ Semi-structured interviews can focus directly on research topic and moderately strong lines-of-inquiry</li> <li>▪ Can explain ‘why’ and ‘how’ as well as ‘what’, ‘where’, ‘when’ and ‘who’</li> <li>▪ Creative and unstructured interviews are exploratory in nature; semi-structured interviews can be both exploratory and confirmatory</li> </ul>	<ul style="list-style-type: none"> <li>▪ Bias can occur due to poorly articulated questions and underdeveloped mental framework</li> <li>▪ Inaccuracies in evidence can occur due to response bias of interviewees</li> <li>▪ Inaccuracies in evidence can occur due to poor recall of interviewees</li> <li>▪ Interviewees may say what the interviewer wants to hear, resulting in misleading conclusions about evidence</li> <li>▪ In creative and unstructured interviews, it is the interviewee who decides where the interview will lead, and hence a limited ability for the researcher to develop a line-of-inquiry</li> <li>▪ Lack of reliability due to unstructured nature of some interview techniques</li> <li>▪ Easy to mislead interviewer with false or concocted evidence</li> <li>▪ Responses are difficult to test for reliability</li> <li>▪ Interviewers often lack the skills needed to conduct creative and unstructured interviews, including the ability to establish rapport and knowing when to probe</li> </ul>
<b>2. Structured Interviews</b>	<ul style="list-style-type: none"> <li>▪ Can focus directly on research topic and line-of-inquiry</li> <li>▪ Can provide explanations for evidence</li> <li>▪ Can examine a strong line-of-inquiry</li> <li>▪ Can generally explain ‘what’, ‘where’, ‘when’ and ‘who’ rather than ‘why’ or ‘how’</li> <li>▪ Assure anonymity</li> <li>▪ Easy to replicate</li> <li>▪ Responses can be tested for reliability and validity</li> <li>▪ Relatively quick to carry out</li> <li>▪ Confirmatory in nature</li> </ul>	<ul style="list-style-type: none"> <li>▪ Blindspots can miss key evidence because of predetermined mental framework and/or line-of-inquiry</li> <li>▪ Responses may not reflect the general population or working population</li> <li>▪ Lack of generalisability if participants are incorrectly selected or too few in number</li> <li>▪ Responses limited to numeric findings and lack detail due to closed-endedness of questions</li> <li>▪ Lack flexibility, and new, unscripted or off-the-cuff questions or lines-of-inquiry cannot be asked, and a strict interview schedule must be followed</li> </ul>
<b>3. Consensus Group Methods</b>	<ul style="list-style-type: none"> <li>▪ Evidence can represent the opinion of a group of individuals who have had a common experience or hold a common view</li> <li>▪ Gains in efficiency when ‘interviewing’ a group rather than multiple individuals</li> <li>▪ Moderately strong lines-of-inquiry can be pursued</li> <li>▪ Individuals may express themselves more freely and accurately when speaking within a group</li> <li>▪ Can explain ‘why’ and ‘how’ as well as ‘what’, ‘where’, ‘when’ and ‘who’</li> <li>▪ Exporatory and confirmatory in nature</li> </ul>	<ul style="list-style-type: none"> <li>▪ Bias due to poorly articulated questions</li> <li>▪ Response bias due to peer pressure</li> <li>▪ Inaccuracies due to poor recall of group participants</li> <li>▪ Group members say what interviewer wants to hear or what s/he thinks the group wants to hear resulting in faulty evidence</li> <li>▪ Group think</li> <li>▪ Evidence can be tainted if interviewer/ moderator is not experienced in working with groups</li> <li>▪ Superficial evidence; loss of deep evidence</li> <li>▪ Difficult to maintain anonymity in a</li> </ul>

		<ul style="list-style-type: none"> <li>group</li> <li>▪ Groups can be dominated by one or two strong personalities, thereby tainting the group's evidence</li> </ul>
<b>4. Surveys</b>	<ul style="list-style-type: none"> <li>▪ Evidence reflects the attitudes, preferences, and opinions of a large number of participants</li> <li>▪ Rigorous technique with systematic design, implementation, and analytical properties</li> <li>▪ Generalisable to both the working population and the general population (i.e., high external validity)</li> <li>▪ Can yield descriptive, behavioural, and/or preferential information</li> <li>▪ Generally explain 'what', 'where', 'when' and 'who' rather than 'why' or 'how'</li> <li>▪ Confirmatory in nature</li> </ul>	<ul style="list-style-type: none"> <li>▪ Responses may not reflect the general population or the working population</li> <li>▪ Lack of generalisability if sample incorrectly selected or too few in number</li> <li>▪ Participants in work-based environments may be suffering 'survey fatigue' and thus not take the questionnaire seriously</li> <li>▪ Closed questions and limitations placed on answers may bias responses</li> <li>▪ Allow only for limited or narrow lines-of inquiry</li> <li>▪ Responses limited to numeric findings</li> </ul>
<b>5. Documentation and Archives</b>	<ul style="list-style-type: none"> <li>▪ Evidence can be reviewed repeatedly</li> <li>▪ Evidence can contain the exact names, references, and details of a person, phenomenon or event</li> <li>▪ Can broadly cover a long period of time, many events, and many settings</li> <li>▪ Precise evidence (and in the case of archives, may usually be quantitative)</li> <li>▪ Can explain 'why' and 'how' as well as 'what', 'where', 'when' and 'who'</li> <li>▪ Confirmatory in nature</li> </ul>	<ul style="list-style-type: none"> <li>▪ Can be difficult to find and retrieve evidence</li> <li>▪ Biased selectivity of evidence if the collection of documents is incomplete, which is highly possible</li> <li>▪ Potential unknown or unrecognised reporting bias due to evidence having been tainted by undeclared bias of original document author</li> <li>▪ Access may be deliberately withheld for privacy, confidentiality, or other reasons</li> <li>▪ Access may be technically difficult in some circumstances</li> </ul>
<b>6. Direct Observations and Participant Observations</b>	<ul style="list-style-type: none"> <li>▪ Can cover actions and phenomena in real time and in real-world settings</li> <li>▪ Can cover the context of a research topic and its participants</li> <li>▪ Insightful into interpersonal behaviour and motives</li> <li>▪ Can locate researcher at the heart of an event or phenomenon</li> <li>▪ Unobtrusive measures</li> <li>▪ Can explain 'why' and 'how' as well as 'what', 'where', 'when' and 'who'</li> <li>▪ Exploratory in nature</li> </ul>	<ul style="list-style-type: none"> <li>▪ Time-consuming</li> <li>▪ Broad evidentiary coverage is difficult without a team of observers</li> <li>▪ Actions and events may proceed differently to normal because participants know they are being observed</li> <li>▪ A significant number of hours are required by human observers to gather meaningful evidence</li> <li>▪ Potential bias due to participant-observer's manipulation of events or evidence</li> </ul>
<b>7. Physical and Cultural Artefacts</b>	<ul style="list-style-type: none"> <li>▪ Evidence can be reviewed repeatedly</li> <li>▪ Evidence can contain the exact names and details of a past person, phenomenon or event</li> <li>▪ Provide insight into cultural and anthropological features of people, a place or phenomenon</li> <li>▪ Provide insight into technical operations and applications</li> <li>▪ Provide a variety of stakeholders with the opportunity to compare and debate the meaning and nature of evidence</li> </ul>	<ul style="list-style-type: none"> <li>▪ Limited selection options when choosing artefacts</li> <li>▪ Physical artefacts may be unavailable to the investigator</li> <li>▪ Interpretation of relevance or meaning of physical artefacts can be difficult and time-consuming</li> <li>▪ May require technical or interpretive expertise beyond the generalist researcher</li> <li>▪ May be tampered with, concealed, or destroyed (knowing that it may be wanted for research or a judicial</li> </ul>



	<ul style="list-style-type: none"> <li>▪ Allow direct measurement, counting and/or testing</li> <li>▪ Provide ‘hard’ evidence, which tells its own story</li> <li>▪ Generally explain ‘what’, ‘where’, ‘when’, and ‘who’ rather than ‘why’ or ‘how’</li> <li>▪ Confirmatory in nature</li> </ul>	<ul style="list-style-type: none"> <li>proceeding, or is being sought by law enforcement officers)</li> <li>▪ Access may be deliberately withheld for privacy, confidentiality, or other reasons</li> <li>▪ Access may be technically difficult in some circumstances</li> </ul>
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Similarly, ‘trustworthiness’ is associated with validity in quantitative research (Pitney, 2004), and includes consideration of credibility (levels of confidence in the ‘truth’ and accuracy of findings), confirmability (degrees of neutrality in the findings, and how the researcher controlled for bias and personal motivations), and transferability (how the work-based researcher demonstrates findings are applicable to other work-based contexts). Nevertheless, each of the seven sources of evidence have advantages and disadvantages, and these have been detailed in Table 2, which has been expanded from Yin (2016: 114).

### Conclusion

Sherlock Holmes’ cry of ‘Data! Data! Data!’ continues to echo through social science research and detective work. It may even be amplified, and analogies broadened. The case a lawyer presents in an adversarial trial intended to convince beyond a reasonable doubt relies on corroboration, cross-matching and checking evidence, and the mental construction of a bigger picture (Sagor, 2010: 109). The nurse, the medical doctor, and the historian are among those who systemically ask questions and use lines-of-inquiry and multiple sources of evidence in order to understand people, trends and phenomena. Similarly, Zinnes (1980: 339), who identified parallels between detective police investigations and research 40 years ago, stated “the difference between great detectives and poor ones lies ultimately in the ability to make the creative leap from the evidence to the full picture. But surely, assembling as many clues as possible in as coherent a way as possible provides the best possible base from which to make such leaps”.

The fields that a detective may work across, from the instinctive to the systematic, draw upon the many different types of evidence discussed in this paper. Lines-of-inquiry and evidence gathering have been explored using USQ’s Professional Studies HDR programme as the site of an intersection between policing and the scholarly academy. The increasing number of senior police officers enrolling in this programme have made it a timely necessity to give sustained consideration to where and how lines-of-inquiry and sources of evidence, notably the main sources of primary and secondary evidence used in work-based research, interact. In discussing the possible sources of evidence in work-based research examples have been provided from current professional development-based research projects undertaken by senior police officers which rely upon the systematic use of these sources, although these reflections are salient beyond one university programme.

In the context of policing, it can be concluded that “describing detective work as a science is seen as increasingly relevant with the growing influence of forensic science and investigative psychology (e.g., interviewing and criminal profiling). This approach removes the mystery around detective work and offers an opportunity to take on a more evidence-based approach, grounded in science, to the development of detectives” (Westera, Kebbell, Milne, & Green, 2016: 2). This observation however may also run in the opposite direction: social science researchers may also benefit from an association with and invocation of the evidential

rigour of detection, where the data elicited must withstand rigorous scrutiny and testing.

The data presented by this paper represents one example of how practitioners bring knowledge, skills and expertise to the sphere of WBL and research in a higher education context. However, what we have attempted to show in the example of police detectives, there is not only an advantage to the in-depth knowledge, skills and expertise insiders bring to higher education, but a valuable additional synergy facilitated through this approach to learning. For work-based learners in a variety of fields this paper thus represents a working example of how synergy can be created in WBL and within a specific profession, but also points to relevance for a wider range of researchers in other fields of investigation.

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