Contextuality and Information Systems: how the interplay between paradigms can help

Mohammad Hossein Jarrahi
The School of Information Studies
Syracuse University
337 Hinds Hall,
Syracuse NY, 13244-4100, USA
+1 315 443 5504
mhjarrah@syr.edu

Steve Sawyer
The School of Information Studies
Syracuse University
334 Hinds Hall,
Syracuse NY, 13244-4100, USA
+1 315 443 6147
ssawyer@syr.edu

ABSTRACT
Through this paper, we theorize on the meanings and roles of context in the study of information systems. The literatures of information systems and information science both explicitly conceptualize information systems (and there are multiple overlapping definitions). These literatures also grapple with the situated and generalizable natures of an information system. Given these shared interests and common concerns, this paper is used as a vehicle to explore the roles of context and suggests how multi-paradigmatic research – another shared feature of both information science and information systems scholarship – provides a means to carry forward more fruitful studies of information systems. We discuss the processes of *reconstructed logic* and *logic-in-use* in terms of studying information systems. We argue that what goes on in the practice of researchers, or the logic-in-practice, is typified by what we are calling *the contextuality problem*. In response, we envision a reconstructed logic, which is an idealization of academic practices regarding context. The logic-in-use of the field is then further explained based on two different views on context. The paper concludes by proposing a model for improving the logic-in-use for the study of information systems.

KEYWORDS
context-aware research, information system, information science, positivist research, interpretive research, generalizability, internal validity

INTRODUCTION
As background, some forty years ago, Simon [1] used the metaphor of an ant crossing a beach to illustrate rudimentary principles of contextual behaviors. A wobbly line, its trajectory, marks the path of the ant. The trajectory is complicated as the beach is strewn with pebbles, rocks, and other various obstacles. The apparent complexity of the ant's behavior over time is largely a reflection of the complexity of the environment (the surface on which it moves) in which it is embedded. This metaphor emphasizes the constraining and enabling roles, that "context" can play. Scholars of information systems, like most social scientists, build from an often implicit dynamic between micro-activity (the ant's movements) and macro-structure (the obstacle-strewn beach).

Acknowledging the complexity of any social reality means we have to examine the ongoing interactions between these two aspects. To isolate these micro / macro interactions, a useful theoretical conceptualization needs to address the context within which the practices unfold. In doing so, the researcher must go through a process called *contextualization*. Contextualization is the "linking of observations to a set of relevant facts, events or point of view that make possible research and theory that form part of a larger whole." [2] This contextualization process allows researchers to build situational and temporal conditions directly into their theories, and relate these to conceptualizations of embedded phenomena of interest.

However, the contextualization process is fraught with difficulties as it involves a trade-off. It encourages researchers to explore deeply the context of study and to integrate the contextual meanings and interpretations into their theoretical model. Paradoxically, and due to the idiosyncratic nature of each context, the results of this process will likely be considerably skewed towards the particularities of the context of study. As such, the models engendered by typical context-rich studies are more difficult to abstract from and, hence, to generalize. We call this trade-off between rich contextual insight and cross-context generalization the *contextuality problem*.

RECONSTRUCTED LOGIC

A reconstructed logic is an idealization (not a description) of scientific practices [3]. It idealizes the logic of information systems regarding the notion of "context" only in showing us what it would be if it were extracted and refined to its most pure form. To idealize the contextualization process, we draw on the definition proposed by Pettigrew [4]. While situated in his research regarding strategic organizational change, the framing (if not the topic) is valuable for the case we are making. Pettigrew looks into the history of emergent change in organizations, assuming the events are situated in their settings. The changes he suggests are shaped by the organization's social, economic and political context. Context, in his view, influences action even as it is also being shaped by actions. His analysis mainly rests on two dimensions of context: the *horizontal* and the *vertical*.

In the *horizontal analysis*, researchers are concerned with the temporal sequences of events. This includes history, present, and the future, of events. For instance, if the current state of an information system were the phenomenon under study, researchers would investigate back to the time the first interactions between the system and the organizations have started. They further need to complement this historical analysis with a synthesis of the current situation, and some cogent predictions regarding how the context might look in a foreseeable future.

A *vertical analysis* focuses the researcher's attention to the interplay among broader and more bounded levels of social contexts. Even though assumptions regarding discrete context levels may seem both a difficult and perhaps a risky proposition, it is a common analytic effort, and, disciplines (i.e. sociology, psychology, and social psychology) are framed in part by differing levels of analyses. Certainly isolating any influence rooted in any one level of social abstraction will lead to a less rich picture. Nevertheless, researchers often center their attention to phenomena by first determining the level of analysis as a perspective. For example, much of the Human Computer Interaction (HCI) research often focuses on individual and groups level of analysis. This is understandable, given the problems of interest and the disciplines (i.e. psychology, social psychology) from which much of this work emanates [5].

The issue in play is that an idealized contextual enquiry would need to be sufficiently attentive to both horizontal and vertical dimensions. This means we need to demonstrate how the content of our study (the phenomenon in question) emerges out of its horizontal and vertical contexts: how formative the time dimension has been, and how the content interacts with different levels of its context. Given the possible variations, the research community should be better served by an assortment of theories and conceptual frameworks.

LOGIC-IN-USE

Logic-in-use is the more or less logical cognitive style and procedures used by researchers in their actual practices. This could be different from reconstructed logic, which is explicit formulation and idealization of the logic and procedures. When it comes to the logic-in-use regarding context, two distinct strands of research stand out within information systems. As Dourish [6] notes one perspective views context as a representational problem whereas the other views context as an interactional problem. The former is normally associated with a positivist approach, while the latter is often referred to as an interpretivist perspective.

The central problem for the positivist is "what is context and how can it be encoded?" Seen this way, context is regarded as a piece of information that can be coded and represented. Moreover, content (the phenomenon of interest) and context can be separated. Context is also defined as something delineable and stable: this means the contextual representation will not vary from instance to instance. The relevance of any contextual element is taken to be mostly or absolutely similar across contexts. To this end, most conclusions drawn by scholars embracing this view are seen as a-contextual and the findings are argued as holding true across disparate contexts [7-9].

In contrast to the a-contextualist approach, there is also interpretive research on information systems (e.g. [10]) that frames context as an interactional process. The central concern in this approach focuses attention to how and why people in their recurrent interactions maintain a mutual understanding of the context. The major ramification of this view is that phenomena – like an information system including its design and features – cannot be divorced from the ways that people use them (i.e. [11]). Here, the underlying assumption is that the content and its social context are so intertwined that any separation is a misleading simplification [12].

Positivist arguments are brought about by decomposing and abstracting away numerous contextual elements. Out of countless elements, only a few survive the tests of importance that are central to the focus on generalizing that positivistic analyses pursue. Hence, the theories and conceptual frameworks only look at some concrete relationships (mostly casual) between a few numbers of variables. Surrounding phenomena are controlled or considered "error variance" (if their influence is regarded as meager).

In contrast to the positivist approach, the context is fully problematized in the situated approach. In other words, in their analysis, the scholars who focus on situating their work seek to examine all contextual factors. This sort of enquiry leads to a holistic view of context, which does not diminish or remove contextual elements, even those with scanty influences. The data collection and analysis as such aim to dig as deeply as possible to disclose particularities of a specific context (or contexts). No variable is controlled. Instead of causal relationships, the situated scholar develops narratives as profound explanations of the phenomenon and the context within which it arises (i.e.[13, 14]). This is at odds with the representational concerns of positivists, and is more affiliated with interpretive approaches. In this view, context is not taken fixed or delineable, but defined dynamically. Context arises from the activity, and is produced and reproduced in the course of the activity at hand.

Our premise here is that most of the research within information systems, including relevant work published in information science, can be categorized into the two perspectives suggested above. Certainly some researchers may not be aware of the distinctions, and others may not make explicit their notion of context [15]. No matter, our point is simply that most of the research done by information systems scholars falls into one of the above categories.

A second point to note is both approaches suffer from different sets of contextualization deficiencies. A positivist study can suffer from a lack of contextually-relevant richness. This is because many contextual elements are not taken into consideration, as these models are designed, based on principles of parsimony, to explore a few variables. As a result, the theoretical frameworks brought forward by scholars taking this approach might not include an array of variables that differ from a context to context. These become un-accounted for in the de-contextualized model and may possibly obscure the research results.

Conversely, interpretive studies typically develop a detailed accounting of context. The interpretivist approach to research provides scholars with a means for accommodating contextual understanding and a rich description of the embeddedness of the phenomena. This thick understanding of the context often lends interpretive research more internal validity. However, interpretive scholars are often unable or unwilling to bring their deep insights to bear on other settings or contexts. This makes interpretive results more difficult to generalize to other contexts.

Broadly speaking, then, the logic-in-use of information systems can be represented by the two divergent and possibly incommensurable perspectives, which both seem inadequate when it comes to production of both generalizable and context-rich theories. The contextuality problem that arises here can be cast into the complexity/uncertainty argument of Simon [16]. Simon postulates that any situation is characterized in terms of the degree of complexity and the degree uncertainty. The degree of complexity represents the amount of relevant information that is available in a given situation; the degree of uncertainty represents the availability and validity of information that is relevant in a given situation.

As far as the understanding of context is concerned, the positivist research demonstrates a high degree of uncertainty and a low degree of complexity. As discussed, the positivist's pursuit of parsimonious theoretical models means consciously choosing to ignore additional contextual information. The sole focus on a limited number of variables may leave out some precious and relevant contextual elements. The simplification and abstraction required for authentic positivist designs, while diminishing complexity, often mask interesting features from the subject of study. Kaplan and Duchon [17] argue that the "stripping of context buys objectivity and testability at the cost of a deeper understanding of what actually is occurring" (p. 572).

On the other hand, interpretive research appears to be adept at eliciting contextual information. Intepretivists strive to take a full account of context and the way it relates to embedded phenomena. So interpretive research tends to provide a sensible approach for dispensing with contextual uncertainly. This is achieved through generating more contextual information when they are scarce. However, interpretive analyses often give rise to the complexity problem where the number of concepts and connections needed for understanding might be overwhelming and too complex to analyze.

In any context-aware research, there are virtually an infinite number of contextual parameters to consider. In this light, interpretive researchers often have a difficult time organizing contextual variables, isolating idiosyncrasies, and finally articulating an abstracted theoretical model that could span across a reasonable number of organizational contexts. In interpretive research, the effort to generalize findings is also generally post-hoc. This is because the situated nature of the analysis means much of the insight on concepts and relationships cannot be predetermined. These relationships among concepts can only be brought to light through the researcher's involvement. Only then can the interpretive researcher look for contexts that share commonalities with the context within which he or she has conducted the research.

Approach	Perspective	Issue	Context Approach	Abstraction vs. Representation	Result	Outcome
Positivists	Reductionist view (focuses on only more important elements)	Uncertainty (many contextual elements are left out)	Control contextual variables	Abstracting away idiosyncratic elements	Parsimonious models	More generalizable
Interpretivist	Holistic view (tries not to isolate any elements)	Complexity (too many identified contextual elements)	Problematize context	Representing idiosyncratic elements	Detailed and localized models	More internally valid

Table1: Comparison between the two paradigms

Some scholars posit that no reconciliation between these two conceptualizations can be achieved. For example, Burrell and Morgan argue that the two views are mutually exclusive paradigms [18]. That is, any move toward the other extreme would amount to an implicit assumption that the alternative effort was misguided. Relative to information systems, Dourish [6] echoes this argument, stating that sharp epistemological differences make these two positions incompatible. That is, the concept of "context" suggested by the positivist tradition, and the interpretive account, are similarly incompatible.

A MODEL SUPPORTING CONTEXTULITY DIALOGUES BETWEEN PARADIGMS

In the remainder of this paper, we argue for an interchange between the two paradigms in order to address the contextuality problem, independent of the incommensurability contention. For this purpose, we suggest that a model based on which the interplay can develop. Our premise is not reconciliation, but scholarly pragmatism: what can we use from the work done by others in a productive fashion?

We advocate a more proactive interplay between these two paradigms, one that acknowledges both differences and parallels in terms of the notion of "context". Such interplay will allow researchers in both traditions the possibility of reaping benefits by drawing findings from studies conducted under one paradigm into the conceptual frameworks of another. This process is rooted in the processes of decontextualizing and recontextualizing, done in such a way that they inform the research within a different paradigm [19].

Given strong social, intellectual and historical differences (and perhaps distrust), we proactively note that we are not disregarding the importance and practical issues of entrenched ontological and epistemological differences. Rather than conflating the differences in pivotal principles, we focus here on a pragmatic approach which respects paradigmatic coexistence. Building from work in the pragmatist school of philosophy of science, we argue for "whatever philosophical and/or methodological approach (that) works best for the particular research program under study" [20]. This view on the doing of science espouses using whatever approaches seem most useful or appropriate to deal with context in our research enterprise. This approach is practically oriented toward a specific problem, namely the contextuality problem. So what counts is not origins but outcomes [3]. In this way, researchers from different paradigms should be able to draw on the results of studies affiliated with a contesting camp, no matter their perspective.

Our pragmatic approach to depicting context is premised on the dichotomy represented in differences between the context of discovery and context of justification, as suggested by Popper's philosophy of science [21]. The process through which a theory is discovered is referred to by Popper as *the context of discovery*. This relates to induction wherein theory or general statement is extrapolated based on a number of given instances. According to Popper, *the context of justification* has to do with the empirical testing of a theory. The validity of a theory is not ascertained in the context of its discovery, but in the context of justification. The context of justification involves deduction -- where the predictive value of a theory arises from the crucible of supporting and disapproving empirical evidence. The asymmetry between the context of

discovery and the context of justification suggests that "as long as the theory survives empirical testing, its origin makes no difference." [22] The deductive approach, used in the context of justification, is independent of the process within which the theory has been constructed.

Framing research as building from the context of discovery and refining the context of justification, we can discuss a model, which facilitates the interchange between the two paradigms while both paradigms possess their own unique context of discovery and context of justification. This interchange is aimed at raising our understanding of the extent to which general theoretical propositions within the scholarship on information systems are context dependent. This is both a conceptual and pragmatic problem that arises when any theoretical model is constructed. Earlier, it is suggested that a critical aspect of the reconstructed logic of our field is producing theories that give rise to rich contextual insights while being reasonably illustrative across different contexts. We argue that the two paradigms would each be better served if they were able to capitalize on one another's strength, thereby offsetting their own particular limitations. This exchange does not require any party to retreat from its norms or central beliefs, but permits both to pursue a more contextually profound and generalizable sets of arguments.

The interpretive context of discovery, as mentioned earlier, gives rise to heightened understandings of context by focusing on the production of meanings and concepts used by actors in real settings. This work provides important insights into how meanings and their implications are shaped by contextual forces. This sort of research is known for its high degree of internal validity [23]. The typical result is an array of implications regarding the content (the phenomenon) within *a* context. However, these implications are less generalizable due to an immeasurable amount of contextual and more or less idiosyncratic information. This situation can be characterized by a high degree of complexity. Here a positivist context of justification can come to play to decrease the complexity. Two ways of coping with complexity are abstraction and reduction -- the basic tenets of the positivist approach. Positivist scholars should be able to evaluate the result of interpretive studies to develop less complex and more abstract theories that should hold true across a larger number of different contexts.

On the other hand, the product of a positivist context of discovery will reduce the degree of contextual insights, leading to a higher degree of uncertainty regarding explanation. The higher degree of uncertainty can be addressed by an interpretive context of justification. The main strategy in the face of uncertainty is to generate more contextual information. Again, due to the independence of the context of justification viz. the context of discovery, interpretivists can draw from the results and models done in the positivist tradition and evaluate them on the grounds of a given context. A general theory grounded in a positivist context of discovery would then be enriched through an interpretive context of justification.

In this way, a cyclic dialogue which addresses the contextuality problem can be established between paradigms. The model has its root in "the wheel of science" (See Figure1) which strives to marry theoretical and empirical worlds [24]. Empirical investigations are conducted within context of justification and context of discovery. The model explains the result of both empirical endeavors as theories (See Figure 2). This is because the context of discovery would naturally lead to a theory, and the context of justification would touch the theoretical world through proving, revising, or rejecting previous theoretical constructs. Through this recursive model, the information system community as whole would diminish complexity and uncertainty surrounding the contextuality problem. The empirical investigation of each paradigm (represented by context of discovery and justification) can address the limitations of the theories produced by the other paradigm.

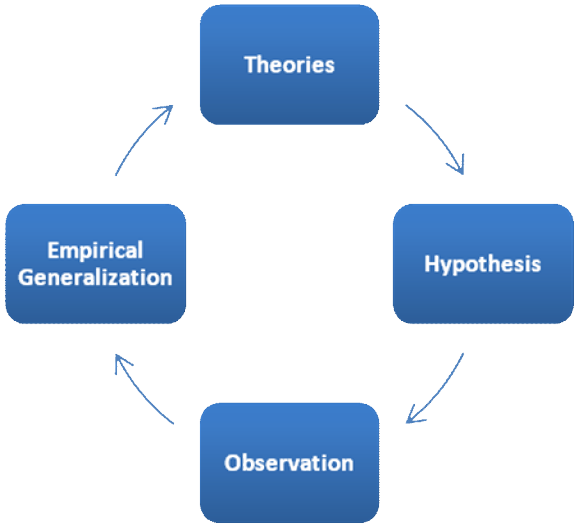

Figure 1: Wheel of Science, adapted from [24]

The cycle lets members of the different scholarly communities to foster the empirical content of its theoretical postulations [21]. Both positivists and intepretivists can extend the depth and the breadth of core conceptual issues. Both are engaged in theory development and testing. Both contribute to the increasing depth and value of generalizable and contextual arguments. A positivist empirical enquiry can lead to insights that are valid across contexts (cover the breadth) whereas an interpretive empirical enquiry can heighten the depth of contextualized insight. That is, through this recursive interaction that both internal validity and generialzaibity improve. Hence, as for the contextuality problem, the two can function as complementary paradigms rather than contradictory or competitive truth regimes.

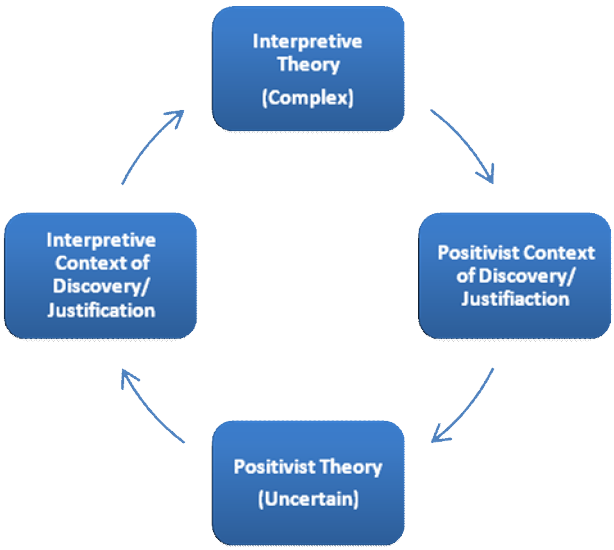

Figure 2: The contexuality dialogue between paradigms

EXEMPLARS FROM THE INFORMATION SYSTEMS LITERATURE

We introduce two sets of studies that have successfully laid out an inter-paradigm dialogue. The first describes a positivist research design built on an interpretive model. In the second example, the researchers seek to reflect on a positivistic model, and to develop possible extensions in an interpretive fashion.

An Interpretive context of discovery leading to a positivist context of justification

Lacovou et al [25] articulate a theoretical model for the determinants of the adoption of electronic data interchange (EDI). The model embraces *readiness*, *perceived benefits*, and *external pressure* as concepts that influence intent to adopt EDI systems. The research typifies what we call an interpretive context of discovery where the researchers generated a theoretical model, using an interpretive, case-based approach. The study was conducted based on work in seven organizations. These were suppliers to the British Columbia (BC) government, which was currently pursuing an EDI initiative. These small suppliers were target of an EDI implementation plan. The main data collection method was face-to-face interviews with managers of the organizations. Although the model affords deep insights into the contingencies of EDI adoption within the context of these organizations, it is less amenable to a larger set of organizations and for those that are not the agencies in support of liberal democracies. The researchers recognize this, noting the need for further research based on larger scale studies to examine the validity and applicability of the model.

Later, Chwelos et al [26] undertook an empirical test of the model in a positivist way. They designed a survey of senior purchasing managers of SMEs. The sample frame was chosen from purchasing managers of Purchasing Managers Association of Canada (PMAC); the researchers collected 317 responses. The study concludes that all three concepts (readiness, perceived benefits, and external pressure) would influence intent to adopt EDI. They found however, that external pressure and readiness are considerably more important than perceived benefits. This research can be characterized as a positivist context of justification where a positivist approach has been employed to deductively validate an interpretive model. This approach enabled the researchers to embark on a random sampling, and test a theory within the broader context of SME firms in Canada (which was assumed as the population). In this way, they have been able to go beyond the initial contexts within which the theory was constructed, and craft more fine-tuned and generalizable theories.

A positivist context of discovery leading to an interpretive context of justification

The second example illustrates an interpretive context of justification which empirically evaluates a theory arising from a positivist context of discovery. Davis [7] synthesized findings from a range of diverse research and

proposed a positivist model which explicates how users come to accept and use information technologies. The theory includes two main constructs: *ease of use*, and *perceived usefulness*. His initial study used two experiments involving a total of 152 users, and four applications programs. Davis contends that the psychometric properties of measures and the patterns of empirical associations, across two different populations, two different systems, and two different research settings provide evidence for external validity. Here the positivist design, focusing on sample design and control variables, gives rise to general statements about the determinants of an information system's adoptions which are assumed to be valid across contexts. However, this type of design might not be able to explain the other influences stemming from more subtle variables. Simply put, the model is incapable of conveying other interesting variables which might vary in different organizational settings.

The model can be complemented by an interpretive context of justification through which deeper insights are offered regarding specific organizational arrangements. Bjørn et al [27] drew on the model, and investigated the acceptance of a groupware technology within a virtual learning team in an interpretive and qualitative way. The empirical data are drawn from a large in-depth qualitative action research study, involving four students groups in two different master programs in Roskilde University. This interpretive context of justification led to a more context-specific understanding. It essentially takes account of a chronological sequence of events (including successes and failures). In addition, the research focuses attention to groupware support for social awareness, a reason for its acceptance in virtual learning teams. This has been found to be a critical condition for establishing and maintaining such teams. It also concludes that the causal relationship between *ease of use* and *perceived usefulness*, as an important link in Davis' TAM model, was not significant in groupware acceptance in virtual learning teams. Thereby, this study, based on an interpretive context of justification, could enrich the model, constructed in a positivist context of discovery, by supplying more contextual information on a specific situation and regarding a specific technological use.

CONCLUSION

We have noted that logic-in-use in information systems research is plagued by the *contexutality problem* where the two dominant paradigms address only a part of the problem. Researchers in the positivist tradition are trained to focus on a small sets of variables and assume other variables fixed, "as opposed to (studying) systems of interrelationships among clusters of variables" [28]. These reductionist approaches are unlikely to capture the nuances of organizational practices. Those scholars pursuing the intrepretivist tradition do not face such limitations. However, by explicitly accounting for contextual particularities, the interpretive research is also criticized for its limitations of generalizability.

We argue that the model proposed in this paper can facilitate the inter-paradigm interaction, addressing the contextuality problem. This stands in contrast to a worrisome tendency among scholars of information systems to regard the two paradigms as mutually exclusive. While researchers like Guba and Lincoln [29] would posit that the two "cannot be logically accommodated anymore than, say, the ideas of a flat versus round earth can be logically accommodated", we disagree. Building on philosophical pragmatism, we facilitate the construction of meaningful bridges between conflicting paradigms by directing attention to the conjoined problem of de-contextualization and re-contextualization [30]. Our model orients the information systems scholar to frame their work in ways that allow connections to be made and to make clear the differences between the contexts of discovery and the contexts of justification. Furthermore, we suggest the types of resources and capabilities each paradigm can bring into the collective problem solving enterprise.

Our model also builds on an explicit need for research pluralism. Our view is that any single research perspective will likely obscure the contextualization process, since no research paradigm can fully accommodate the richness and complexity of diverse contexts within which information systems are situated. Goles and Hirschheim [31] draw an interesting analogy between disparate research paradigms and religions. While there are difference between Christian, Islamic, and Buddist beliefs, there are parallels as well. By comparing and contrasting them, religious scholars are able to rise their understating of each in its own light, and a heightened appreciation of their links.

However, such a pragmatic pluralism cannot be achieved unless proponents of each paradigm come to recognize their weaknesses, and realize that there is something to be gained by interacting with their counterparts from that other paradigm. Central to the interplay rests the assumption that no one paradigm has a privileged position over the other nor is always superior in terms of problem solving capabilities [31]. After all, the credibility of the information systems community is contingent upon its competence in handling practical problems. This, of course, requires that different research communities acknowledge one another and develop interrelationships regarding their research outputs.

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