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# Life Within the “Empire”

## A Framework for Using the Internet as a Research Collaboration Space

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### ABSTRACT

The authors acknowledge that knowledge creation is a *collaborative* process by nature and attempt to leverage current IS methods and technology to recreate the classical salons that yielded philosophical discourse. Research has demonstrated *physical proximity* as a key indicator of both the undertaking and successful completion of research, yet this physical proximity has not shown analogous carry-over into virtual domains – namely the virtual space provided via the Internet. A non-threatening framework is described that enables temporary virtual team creation in a double-blind environment for many-to-many collaboration. Furthermore, this framework is parsimonious with the greater epistemological orientation of modern publication-oriented research.

### Keywords

Virtual teams, philosophy of science, research, knowledge generation, knowledge discovery, double-blind.

### INTRODUCTION

History has demonstrated the value of collaboration in creative and scientific endeavors, as very little work is accomplished within a vacuum. While occasionally a mind capable of astounding feats – such as inventing Calculus or splitting the atom – has come about in history, correspondence and collaboration with either peers or the larger public remained a vital component. Hence, *collaboration* is demonstrably important in the shaping and refinement of human endeavors.

Philosophy has pointedly demonstrated this fact through a rich history of argument and dialectic: the Socratic method of instruction may be viewed as a handy proxy for full two-way interaction, and later on, philosophical discourse became a social outing, culminating in the salon. The salon served as an intellectual meeting ground and outlet as well as providing a socially equitable space for idea generation. This epistemologically and pedagogically integrative approach to philosophy gave rise to “new methods of argument” that “focused thematically on moral issues” (Bohanan, 2004). Salons had a wider appeal than the philosophical ground within 17<sup>th</sup> century philosophical publication. Conley elucidates this point when he differentiates between the “lecture and treatise” approach present in philosophy prior to the emergence of the salon, and the philosophical arguments seen within the salon, which were “characterized more by debate and by epigrammatic commentary” (Conley, 2002).

Information accessibility and its corresponding social ramifications are a central theme in this paper. Computer networks (as well as our modern-day Internet) held the promise of transparent access to information and individuals. We were promised a boon of knowledge discovery that would cause science to leapfrog over itself as this knowledge became increasingly open and available. Townsend and Bennett describe the “promise of true democracy, free markets, unrestrained speech, and the creation of a global village” (Townsend & Bennett, 2001) where now the Balkanization of scholars into electronic research fiefdoms exists. This presents a danger to Internet-aided knowledge generation as “[m]ore fragmented communication structures are more likely to result in scattered and disunified attention structures in which change is more chaotic and less ‘rationally’ interpretable” (Spear, 2004).

As architects of information and the social ramifications this information effects, it is imperative to dismantle the draconian intellectual overhead of this Empire while simultaneously advancing science. Collaboration via a zero-knowledge framework with respect to identity is exciting and fosters social *empowerment* and *impact* through the elimination of extant power structures. Our methodological framework is especially valuable to science as it *utilizes* the very infrastructure responsible for scholarly Balkanization and ultimately offers an *additional* venue to further research via collaboration rather than *supplanting* existing methodologies.

## BACKGROUND

### Epistemological Imperative

The Internet is a medium that can expand our cognitive space (Anders, 2001) and simultaneously preserve our anonymity. This latter concept is useful for collaboration via the equalization of social metrics that create limitations in the real world. The introduction of an anonymous, objectively tracked identity gives one admission to a new world: the extended mind. Within this world, the individual can explore research without the sociological ramifications of meeting in traditional environments. The dualistic concept of mind and cognition as separate and disconnected from information-heavy environments lends itself to the idea of fiefdoms; the re-definition and realization of mind (inclusive of cybernetic augmentation) as *bidirectional* – “a feedback loop between biologically evolved capabilities and a richly engineered technological environment” (Hayles, 2002) – will lend itself to immense developments not only in technological advances but in the social structure of humanity. Since present social constraints work against the authors of radical or unconventional ideas, we propose to supersede those constraints by incorporating anonymity within a pseudosynchronous many-to-many framework for collaboration.

The authors also wish to note that their epistemological orientation stems from both a hybridization of the distinctions of the discursive entities mentioned by Foucault (Foucault, 1972) while noting the epochal upheavals of science formulated by Kuhn (Kuhn, 1962). In other words, differences in discursive entities brought on by sharing collaboratively and anonymously can spur or accelerate the paradigm shifts which Kuhn attributes to knowledge formation. Indeed, it has been demonstrated that “much creativity occurs in groups rather than the individual” (Dunbar, 1997). Furthermore, the authors share Spear’s viewpoint that “[s]cientific change is not *either* progressive and cumulative *or* arbitrary and contingent, nor is it driven *either* by experiment *or* by theory” (Spear, 2004). Therefore, we are not saying that the sociology of science in the academy precludes the development of ideas, but are rather providing another venue of expression. Furthermore, the development and subsequent adoption of our framework creates a “standardized research methodology” (Spear, 2004) which can initiate and unify communication between researchers around topics not dealt with in their traditional research streams and professional lives.

### Modern Computer Networks as a Collaboration Tool

In its initial instantiation, the ARPAnet was designed to facilitate the “community of people with common interests [who] began to discover one another and interact through the medium of the computer [via time-sharing systems]”, and Bob Taylor reported being “struck by the fact that [community discovery and interaction] was a wonderfully new and powerful phenomenon” (Taylor, 2004). With the rise of CSNET and, later, NSFNET in the early 1980s, individuals in academic communities were able to communicate and collaborate regardless of geography. Access to the network was limited to the pertinent activities of research and science, and the public were still enormously ignorant of the networks and communications that the network brought to the world. NSFNET was decommissioned in 1990 to make way for larger and more publicly-accessible networks, starting with Freenet.

Software engineer and entrepreneur Ian Clarke proposed the beginning of a framework (Clarke, 1999) that would allow individuals of varying reputations, classes, status positions, educational backgrounds and governments to interact anonymously using a decentralized, asymmetric key-based repository of information. We believe that this architecture, while serving as a good guideline, must be further tailored to specifically suit the non-commercial interests of universities before becoming beneficial to future research. However, once this step is taken, we believe this will be of exceptional value in interdisciplinary fields. It would represent a 21<sup>st</sup> century iteration of the philosophical salons of the Intellectual Enlightenment era. Likewise, such a system would also inherit and extend the properties of the salons; the science and method of knowledge generation itself would be enhanced and extended through increased participation.

The NSF still believes in global collaboration for research, as evidenced by jointly funding a U.S.-Russia joint network initiative, NaukaNet, with the Russian Ministry of Science from 1998 to 2004. Additionally, NSF’s Douglas Gatchell gave a recent presentation (Gatchell, 2005) that includes collaboration and virtual organization as part of the NSF’s cyber-infrastructure initiative. NaukaNet has since become the Global Ring Network for Advanced Applications Development (GLORIAD), a research network that includes parties in the United States, China, Russia and, recently, Korea (“Korea Joins International Computing Infrastructure”, 2005). The NSF is far from alone in its realization: the United States Department of Energy’s Energy Sciences Network (ESnet) head recently presented the DOE’s future network evolution – specifically to “support large-scale international science” (Johnston, 2005). Internet2 (or, more precisely, University Corporation for Advanced Internet Development (UCAID)) and its consortium partners created the Abilene Network, which states “[c]onnectivity to other research and education networks throughout the world and peering with other federal research

networks, thus enabling the international research community to collaborate in new ways" as one of its goals ("About Abilene", 2006). Clearly, large organizations and governments believe in collaboration, but what of the community? Ibarra & Alvarez correctly point out that research "is increasingly being conducted in virtual ... environments" (Ibarra & Alvarez, 2005), and these scientists are "forming virtual working environments where they can share data and computing resources and collectively collaborate to derive new knowledge" (Hey & Trefethen, 2005). Furthermore, data gathered from the World Wide Web is empowering scientific inquiry through the facility of access – in short, what may have taken a scientist a lifetime to collect personally is now available on the Web (Foster, 2005).

However, the reality of the situation is that GLORIAD has limited resources and the Internet2 consortium is unable to provide an absolutely dedicated backbone. And herein lies the problem of collaboration in the academic field: the natural tension between *academic* and *open* publication.

### **ACADEMIC COLLABORATION: WHY SO COMPLEX?**

We have previously mentioned a "tension" between academic publication and open publication. In short, as a community of knowledge discoverers, we conduct our writing in an *exceptionally* different manner than our thinking, or the thinking and writing of our predecessors. We may look at the Internet and its associated academic and research paraphernalia as analogous to salons of the past, yet we certainly are not at liberty to *utilize* the space as such. Given this, individuals within the academic community largely collaborates with whom we know, thus removing the knowledge discovery advantages conferred to us by broader networks. We also are quick to again reinforce our position as a statement of unfortunate fact as opposed to a slight, as *we ourselves are working together by virtue of physical meeting and relationship*.

Much of the current literature involving virtual teams does not seem to appropriately address the problems faced in academia with respect to knowledge development. Certainly, collaborative *meeting environments* have been posed for the purpose of conducting research (Adams, Toomey, & Churchill, 1999), or for facilitating social interaction (Brignull, Izadi, Fitzpatrick, Robers, & Rodden, 2004), or even for supporting "autonomous collaboration" (Edwards & Mynatt, 1997), which replicates our current epistemological fiefdom problem. Literature that relates to social problems inherent within virtual teaming, such as privacy (Bellotti, 1996), also give a presentation not wholly parsimonious to that faced by academics involved in research.

Recently, however, new forms of interpersonal communication emerged online, and these forms would further complicate matters by making pre-publication easier than ever: weblogging ("blogging") and wikis (user-editable web pages). These technologies turned the unidirectional flow of information (such as was found in 17<sup>th</sup> century philosophical writings) into an interactive venue – mirroring the salon.

### **Wikis and Blogs As Salons:**

While blogs can be controversial (Lyons, 2005), blogs can also provide fodder for idea exchanges and a network-mediated asynchronous meeting space – but blog authors are starting to find that this facet of their online existence may have very real repercussions that follow them into real-life. However, the areas of law and philosophy are largely benefiting from blogging, unlike many other areas of academia, and blogs are described as "offer[ing] the kind of intellectual excitement and engagement that attracted many scholars to the academic life in the first place" (Farrell, 2005). Yet the unfortunate fact is that many academic journals are so adverse to pre-publication scenarios that this creates an environment in which it is difficult and potentially damaging to publicly engage fellow scholars in open scientific discourse.

Blogs conceptually represent a meeting within a salon wherein the owner is not precluded from having an intellectual agenda and driving the discussion towards this end. Blogs are non-destructively interactive, meaning that an original idea or "publication" stands until altered by the owner him/herself. Blogs provide a convenient intermediate form of discourse, in which readers of the individual threads or posts may themselves bring up points or positions housed within the same prevailing theme. The term "convenient intermediate form" is used when describing the intellectual contribution of blogs to science, as the information predominantly is published with an underlying one-to-many design. This design orientation inherently and naturally aligns blogs with the "lecture and treatise" method described in the introduction.

Contrast this, then, with the environment afforded through wikis. Wikis allow for a many-to-many approach to collaboration around (a) common document(s). This design philosophy helps to ensure that wikis themselves are parsimonious with the task of collaborative writing ("Wiki", 2006). Ideally, wikis or other collaborative virtual teaming technologies (Adams, Toomey, & Churchill, 1999; Edwards & Mynatt, 1997; Greenberg & Rounding, 2001; Huang & Mynatt, 2003; Yamada et al., 2004) could serve in the stead of the promise of open and accessible information and collaboration, but the social climate architected in academia does not fully allow the technology to excel. Wikis, through allowing many-to-many collaboration, naturally expose documents to the world, as open collaboration is an underlying feature. Short of authors finding each other

out-of-band and setting up a password-protected, private Wiki – a solution yoked with problems existent within traditional solutions as well as the perpetuation of differential power structures between authors – it is clear that Wikis simply will not suffice for academic writing and advancement. Yet Wikis do offer the benefits of providing a collaborative structure around which documents may be built, altered, potentially reverted, and eventually published – with the further ability to gain insight into *whom* has made *what* contributions to the document. Indeed, but for the necessary exposure of Intellectual Property, Wikis may represent an ideal in document-based collaboration.

Given the current academic environment that abhors any whiff of pre-publication, we have wonderful collaborative infrastructures – including projects that allow an individual virtual team member to maintain appropriate “private” or “personal” spaces (Greenberg & Rounding, 2001; Huang & Mynatt, 2003) – that run at odds with the current academic publication environment. This represents a loss for the world’s scholars, academics, scientists, and general public, and there exist long-term effects of such a loss on both science and epistemology.

## OUR FRAMEWORK

Scholars are currently living within an academic ecology that obviates the open and free exchange of ideas through its eschewal of pre-publication and its value for generating closely-held Intellectual Property. This frames the understanding and subsequent research question that bounds this piece:

*We understand the value of collaboration in science and knowledge creation. And yet, most of the collaborative systems seem to solve the problem only **after** researchers have found each other. Can we utilize the Electronic Empire to better conduct research and effect social and scientific change?*

This historic inability to provide a platform for researchers to find each other is what we term the *Prime Mover* Problem.

### Solving the *Prime Mover* Problem in Academic Research

Even though dark shadows have been cast across the future of structured institutions of academic endeavor in reasonably current literature (Noam, 1995; Smith & Prados, 2000), our own belief is that Universities provide *exactly that which literature and current systems cannot: an environment suited to meeting research partners*, albeit in limited numbers. Beyond the University, it is difficult to *find* a research partner, as individuals are intellectually constrained only to their small area in a manner which *exactly mirrors* the constraints faced in the real world. It is precisely *this* issue, we feel, that must be addressed before systems – no matter *how* elegant – may be leveraged to provide services beyond merely a spatial proxy. And so we look to the problem as one analogous to dating; in effect, we are suggesting a system to allow for “research match-making”. Such a system will not *only* be able to leverage temporal and spatial shifting that is afforded us via virtual teaming and electronic co-presence, but will also provide *an active platform that supports the method of conducting research and seeking out research partners*.

*Proximity* is used heavily when selecting research partners; thus, a researcher is more inclined to work with someone that they are currently in close proximity to, or have known through prior contact. Proximity serves as a key predictor in research group membership *even when electronic collaboration* (such as email) *is available* (Kraut, Egidio, & Galegher, 1990). It is also noteworthy that proximity is not limited to a *static* temporal and physical space. Researchers active in publication and conference attendance face a chance meeting between *more socially-minded* scholars. Although context-rich, conferences may be viewed as sub-par venues next to journal publication, so these meetings tend to be most immediately beneficial to junior researchers. Additionally, it is infeasible to attend conferences daily or on any single researcher’s own terms. Finally, there exists a heavy *social* component in a conference – while refreshing and energizing, conferences carry with them the same trouble as physical proximity. There is no system that can explicitly alert two researchers to the presence of the other and their “closeness”; in effect, conferences fail to have a mediating in-band “match-maker” for attending researchers. Collaboration should ultimately allow for a diversity of personalities to enter the discourse - our framework expands the base in diversity of thought the university tries to encourage in its hiring practices. We recognize that knowledge generation is organizationally contextual (Gumport & Snyderman, 2002), and aim to free individuals from certain binding ramifications.

It is important to note, however, that proximity does not always yield the best “match” in research direction, area, or expertise. This effect of *familiarity* usurps even the notion that “[w]hile physical distance is still a factor, it is clear that its constraining effects have weakened” (Johnson, Siripong, & Brown, 2006). With this in mind, it is important to recognize the importance of the “*Prime Mover* problem” in research – specifically, that of finding a research partner with similar interests, experience, or ability. However, it is also the position of the authors that pure science and knowledge is also “blind”, meaning that an ideal system should ultimately be able to remove the question of ego and power structure or status from knowledge generation.

Collaborative systems such as email or electronic forums exist, but it is important to recognize that the framework we are proposing is drastically different than existing systems. In email and forums, authors must endeavor to find each other – thus the *Prime Mover* problem remains. Furthermore, these collaboration modalities have issues – email and un-moderated forums both lack administrative control that would provide punishment for intellectual property theft, and moderated forums have legal strings attached to the presentation of content. Furthermore, email represents an *asynchronous* communication channel, and research has suggested that higher-level technical individuals (e.g. computer administrators) prefer synchronous communication methods, such as is allowed by the telephone, when given a choice (Hinds & Kiesler, 1995).

The movement of traditional academic science into industry can easily exemplify our argument that research has become Balkanized. Governmental, university, and corporate entities encourage academic professionals to form their own companies, labs, and other separate institutions to further their research streams (Owen-Smith & Powell, 2001). However, this level of specialization makes isolation a key factor in protecting intellectual property. This raises the question of whether an epistemological framework, which is anathema to the exchange of ideas in a university environment, can truly aid the long-term growth of knowledge generation. The values of industry and academia are not always congruent and the marriage of universities to corporate partners has had its share of drawbacks (Nelsen, 1998).

### System Description

We propose a framework that matches individuals along research dimensions, provides zero identity disclosure of its users, and maintains capability for sanctioning of these anonymous users. In this way, research interests and the greater interests of science are preserved, while also preserving the IP of individual users through enabling effective policy controls (e.g. sanctions against unruly users).

This system would ideally have unfettered and dedicated bandwidth but may arise originally within the existing framework provided by the Internet. Given the utility of wikis as a many-to-many collaborative writing forum, this methodology may be used in conjunction with either a network architecture that supports anonymity (e.g. Freenet, Popenet (Dai, 2004), or The Internet Router (TOR) (Dingledine, Mathewson, & Syverson, 2004)) or a higher-level authentication scheme that hides identity to effectively create a "double-blind" environment for authors and their collaborators. The system utility comes in facilitating *collaboration* and *knowledge generation*, and these ends will undoubtedly carry an author outside of the "circles" that he or she has become accustomed to. Additionally, an interface akin to a wiki can facilitate both *ownership* and *historical posterity* of the documents and their associated metadata. This is valuable when it comes time to publish and evaluate each author's contribution to the work as a whole. The provision of objective data demonstrating intellectual contribution aids in the fair allotment of authorship and allows authors to more clearly focus on knowledge generation.

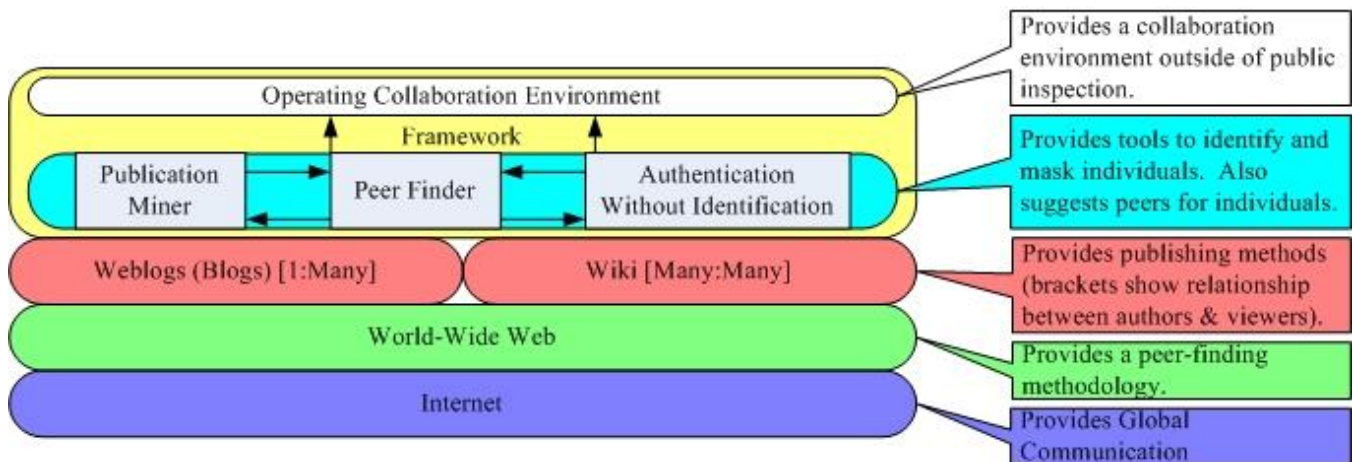


Figure 1 - Layered View of Our Framework and the Supporting Contexts

This system is both novel and ideal since it introduces peer-accountability without the veneer of institutional academia to influence research streams and ideas. The framework is comprised of three modules that sit atop a Wiki structure and work interdependently with each other to provide a collaboration environment. The *Publication Miner* and *Peer Finder* modules work to suggest potential "research matches" to an author, while the *Authentication Without Identification* module presents authors with double-blind anonymity.

The anonymity that we propose is liberating and powerful: junior researchers may pair with more senior individuals and bring fresh insights and contributions to the document, while researchers with *established reputations* may propose and pursue ideas that are either unfashionable or taboo within their disciplines without fear of immediate reprisal. Even here, if the subsequent manuscript becomes something that the individuals involved would like to pursue, the option of publication exists – and a finished article provides the intellectual currency with which the authors may defend their position.

What the authors gain here is *time* (if the presented idea is not commonly accepted and “ready” for publication at the time of writing), and the leisure to pursue ideas with co-authors they would otherwise never work with. On this note, there exists a real benefit to academics, as a system that works in this fashion would be able to use metrics to best “match” authors with each other along a common dimension; this affordance will prevent fields from falling prey to their own dogma, and may increase the depth and breadth of the discipline as a whole.

Social networking sites such as Friendster, Myspace, and Facebook provide a high-level theoretical analogue that frames the matching of individual authors along dimensions related to research – rather than relying upon self-report and *subjective* data for match-making, our system enables the use of objective data to suggest potential research “partners”. However, research metadata would be considerably more involved.

Principally, our framework facilitates both “ends” of research – the initial struggle to *find* appropriate collaborators, and then management of the common document being collaborated upon by the authors. An important component of this system is its assurance to all users that each document and its changes are tracked, such that the fear of intellectual property divulgence or sharing with an “unknown entity” is minimized. The system would initially be a very broad collaboration space; however, there are numerous opportunities for open and tracked sharing of knowledge. The research collaboration space may eventually include provisions for chatting and file sharing in addition to documents. The framework provides a medium of anonymous sharing of information but also allows users as much latitude as one is prepared to handle when entering research relationships while maintaining an objective ownership of what is shared.

Our framework builds atop existing infrastructure – as demonstrated in Figure 1 – and proposes the use of an authentication subsystem comprised of many organizational “nodes” connected to the framework. The purpose of this is as mind-boggling as it is straight-forward: to separate *identity* from *authentication*. One of the authors of this paper (Pilson) has developed a prototype system that is able to achieve *authentication* without divulging *identity*. This subsystem is more secure than a traditional HTTP username and password dyad, and maintains a *zero-knowledge* view of each user. However, the architecture of this system is limited to the organizational (e.g. University) level, thus necessitating a second layer of translation to mask an authenticated author’s organizational membership. A graphical and high-level depiction of this transform is given in Figure 2.

Here we propose, not a replacement to accepted traditions of conference and journal publication, but a complement to any oppressive structure proposed by such. This is the suggestion of not only a practical framework, but also a change in attitudes toward research in general. Just as profit is the primary motive in business so shall it be the same in academia. However, there may not be immediate material profit in the form of publication, recognition and patent revenues, but in the liberation of the market of ideas.

### Caveats

Administration and moderation of any distributed system is difficult. The methodological framework presented here is potentially difficult to administrate and moderate, given its scale, size, and subject material. We posit that administration and moderation of the system can be handled on a distributed and rotating basis. It is our position that the *community* ought to have the final say about whether an individual is reliable or not, or in the wrong – and, subsequently, whether they may retain access to the system.

To aid this “bottom-up” approach to moderation, certain metadata can be introduced giving users ratings – much like systems used on eBay or Amazon to demonstrate the reliability of vendors. This executive layer will have to offer much decentralization and numerous opportunities for redemption if a rating is unfair. However, in addition to this, the system itself should provide some *objective data* about each user. Such data may include the number and type of publications, keywords that the user has used, and perhaps eventually make use of lexical text-mining and analysis to match individuals along a dimension as foreign to us now as writing style. While this is only an example, the example stands, as it is very difficult, cumbersome, and potentially irritating (as we have all experienced) to collaborate with someone with a very different writing style.

Security, of course, is another potential caveat. If we are to propose security in such a system – which we would be inclined to – we must also discuss implications of this. As the architects of information flow and control, we understand the use of

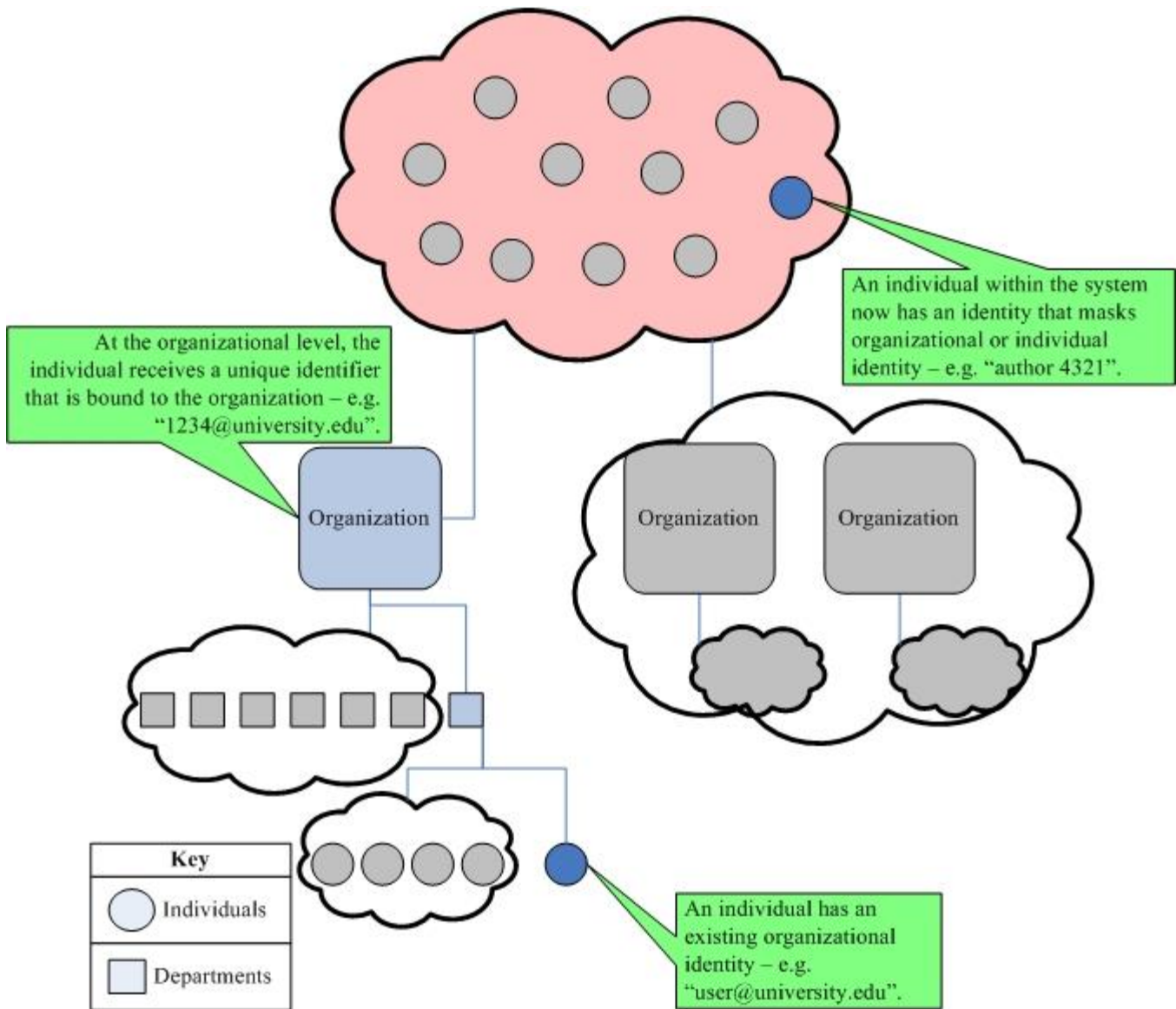


Figure 2 - Framework of the "Authentication Without Identification" System Component

key-hash functions and asymmetric key algorithms to be demonstrably corruptible when unsavory characters are willing to invest time in attacking the system through any means available. These means include theft, extortion, and social engineering. Given this, it is entirely reasonable to suggest use of a strong Public Key Infrastructure (PKI) algorithm rather than a simpler hashing algorithm. PKI has the advantage that possession of the “private” key demonstrates identity; if, however, a private key becomes compromised, it would be extremely difficult to solve disputes involving authorship through use of this “tightly-held” key alone.

The benefits of writing collaboratively in the fashion outlined here, however, far outweigh these few caveats. Furthermore, many security threats are quashed in the *sociotechnical* side of our system – if an offender comes from within the system, then social sanctions as barring from future publication and blacklisting are entirely possible and appropriate. We specifically *do not move* to “engineer” academia out of our framework, and this works to the benefit of future users as well as the broader scientific community.

**FUTURE WORK**

In this paper, we have presented a framework that describes a system methodology that we believe will greatly aid in research and knowledge generation. We have demonstrated the necessity for such a system, and have discussed some social



ramifications that derive from its use and subsequent larger-scale adoption. However, we ultimately would like to *apply* this epistemological framework and build a fully-functioning system that still maintains all the underpinnings of design and knowledge generation presented here.

We would initially like to begin physical construction of our system with a single organizational "node" and subsequent empirical examination of created research literature. As the final system design will have one "node" per university, this stepwise development approach will aid in system implementation and Human-Computer Interaction (HCI) optimization. Following this initial step, the next logical development will concern the creation of prospecting – "partner-finding" – metrics. The authors have paid keen attention to the information provided by some scholarly indices (e.g. IEEE), and will initially leverage this meta-data in an effort to produce a system capable of rudimentary "partner-finding" through keyword matches.

It is hoped that, through exposure, researchers will start to think outside their cohort circles and venture into co-authorship with individuals they have never met, but with whom they are ideally suited. Such "prospecting" and match-making may ultimately equalize the *footing* of participants while significantly expanding their individual research scope and *footprints*, and lead to a return of an Intellectual Enlightenment age, matching the explosion of novel and wholly different philosophical views and subsequent publication opportunities. Science and knowledge generation are not monolithic entities; insight through increased publication number and viewpoint is ultimately helpful for knowledge discovery and for science as a whole.

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