

Codifying knowledge about ethics into ICT professional Bodies of Knowledge (BoKs): an analysis of approaches.

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Abstract: Ethical concerns about the development and ubiquity of ICT (Information and communications technology) are rising as awareness of our increased dependency on ICT, combined with the potential lack of transparency of new technologies such as IoT and AI, unfold. One way of tackling this is to increase professionalism within ICT, and Bodies of Knowledge (BoKs) are an important part of this. BoKs represent the knowledge needed to function as a profession and are becoming increasingly essential to aid communication and encourage shared values and practices, particularly in emerging professional areas. They are valuable and influential in developing the scope and maturity of the ICT profession and, in turn, ICT development in society. Thus, identifying and understanding the codification of ethics in BoKs is important to maturing ICT professional practice in resolving ethical concerns. This paper 1) explores considerations and approaches to the incorporation of ethics within BoKs, and 2) carries out content analysis on how ethics are codified within the content structure of ICT BoKs. Findings reveal a range of different approaches, which suggests the value of categorising these approaches and developing guidance on a more consistent approach. We conclude by recommending future research for revealing and tackling both overt and implicit aspects to ethics within BoKs.

Key words: Bodies of Knowledge; knowledge codification; ethics; ICT profession; knowledge management

1. Introduction

Knowledge Management (KM) concerns knowledge, but what kind of knowledge is ethics? This is not only a question for individuals but also plays out in the workplace and wider society. How can we know what is 'good' and how can we get better at doing it? The concept of professional ethics is familiar within our understanding of established professions, such as medicine or law. Professional ethics are less defined or understood in newer or emerging professions such as the ICT (Information and communications technology) profession, however. The question of how the ethics of emerging ICT professions are codified and managed is becoming increasingly important in light of society's increasing intertwinement and dependence on ICT, particularly given newer technologies such as AI and IoT (Lemonne, 2018). Many major safety critical infrastructure systems are increasingly dependent on ICT, for example. As the complexity, iteration, and pervasiveness of ICT in all facets of life increases, and as significant risks of negative impacts of ICT emerge, public concern about potential ethical implications increases. Another reason is that as these technologies develop, new professions start to emerge around them. As these professions mature, their knowledge is codified, and processes put in place to consolidate and share knowledge, as well as develop a shared sense of ethical professionalism. KM could contribute to improving professionalism by providing guidance on developing effective Bodies of Knowledge (BoKs) as part of the broader domain knowledge infrastructure (i.e. codes of ethics, certifications, accreditation etc.).

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As professions develop, they generally codify their expert knowledge in a structured document described as a Body of Knowledge (BoK). The 'Core Body of Knowledge for ICT Professionals' (ACS, 2015), for example, provides a reference guide to the ICT BoK. A BoK is a structured representation of the proposed and/or practised knowledge needed to function as a profession, as well as its scope or jurisdiction. Examples include a reference guide, compendium or descriptive handbook. These often explicitly cover some description of professional ethics within that domain, though invariably and often implicitly reflect an ethical posture in various ways. The inclusion and degree of ethical knowledge (or indeed exclusion altogether) in BoKs is itself an ethical stance. The very existence of BoKs and their knowledge claims in identity forming and empowerment of groups has ethical implications for those people. Similarly, a BoK's knowledge claims and their application in structuring/producing a 'legitimate' society may have wider societal ethical implications (Floridi, 2014; Greenfield, 2017). A BoK invariably reflects ethics, explicitly or implicitly, which will have ethical implications, intentionally or otherwise. Thus, both knowledge and ethics are central to the concept of professionalism (Saks, 2012)

Getting better at developing usable and relevant BoKs, as well as considering and incorporating ethics is an important and current policy and social issue (EU Commission, 2018). Despite this increased policy focus on ethics and ICT related BoKs, they have received little corresponding academic attention. In light of this, this paper examines the current state of play regarding the integration of ethics within BoKs of ICT Professions. We do this by (1) exploring existing literature in terms of the intersection of ICT Professionalism, BoKs and ethics, and (2) conducting content analysis on prevalent high-level ICT BoKs that influence the ICT profession. These high level BoKs flow down into knowledge, education, training, and practice of the ICT profession, through books, curricula, accreditation, etc. We then propose some suggestions on how expertise within the KM field could be used to improve and streamline the integration of ethics into BoKs. Finally, we carve the path to a research agenda connecting ethics to BoKs. Whilst we contribute to our understanding of ethics within BoKs of ICT professions, insights gained may also be applicable too other professions, particularly those newly emerging. The RQ guiding this study is: *How is ethics codified within the content structure of ICT professional bodies of knowledge?* Based on results, we discuss how these approaches can best be categorised and understood, and what guidance could KM provide to BoK developers on codifying knowledge about ethics.

The remainder of the paper is structured as follows. In section 2, we overview the three core concepts of this paper, ICT professions, Bodies of Knowledge (BoKs), and Ethics. In section 3, we outline our method for BoK selection and approach to analysis. Section 4 presents the results of analysis, whilst section 5 relates these results back to our original research questions. We conclude (section 6) with some recommendations to the field of KM, as well as suggested future research based on this study.

2. Literature Review

In this section, we discuss the nature and scope of ICT as a profession, as well as significant developments in relation to research and policy linking the ICT profession with ethics. It also covers the focus of this paper i.e. the nature of Bodies of Knowledge (BoKs), in more detail and overviews ethical approaches and how they manifest in the context of ICT. This general overview provides context to the subsequent discussion as well as the wider research agenda of ethics, knowledge, and ICT professionalism proposed in the conclusion.

2.1 ICT professionalism

ICT is a hard topic to define clearly and professionalism is a disputed concept. Grasping these combined concepts is therefore rather complex. The 'European Centre for the Development of Vocational Training' (Cedefop) defines ICT professionals in terms of, 'conducting research, planning, designing, writing, testing, providing advice and improving information technology systems, hardware, software and related concepts for specific applications. They develop associated documentation and design, develop, control, maintain and support databases and other information systems to ensure optimal performance and data integrity and security' (Cedefop, 2016). This implies the scope of an ICT professional can be quite varied, both in terms of research, practice, and ICT focus, with ethical considerations more explicitly evident concerning data integrity and security.

In relation to the nature of professionalism, there is a long historical debate, as observed by Cogan (1955) and more recently by Saks (2012). For example, in the Victorian context, Chua and Poullaos (1993) discussed conflicts

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and disagreement as professions emerged, whilst Eraut (1994) discussed ‘newer’ professions such as education and their struggles to gain equivalent autonomy and status compared to more established professions. Despite these debates, authors generally agree on the importance of a profession’s relationship to at least some expert knowledge, and that some ethical approach be adopted. As expert knowledge is key to professionalism, with ethics also important in this regard, we examine how they can be connected.

Connecting ICT professionalism with ethics is particularly salient in relation to high profile disasters and frauds caused or enabled by ICT, severely weakening public trust in ICT and those who develop and use these systems (Gelles, 2019). In parallel, there is growing concern about ICT ethics and an emerging consensus that ICT ethics must be explicitly addressed (Siebes et al., 2019) as part of the general drive towards professionalism. As the ICT profession is relatively immature compared to the well-established professions of law and medicine, and as society’s dependence on ICT increases, it is imperative that standards improve. Furthermore, maturing the ICT profession can have associated economic and social benefits. For example, this could include a reduction of risks posed by ineffective development and use of ICT, due to poorly trained ICT labour with inadequate ethical awareness.

There has been some prior research and policy work on maturing the ICT profession within the European context. McLaughlin et al. (2012) developed a model of ICT professionalism based on literature analysis and data collection from stakeholders. The model consists of four building blocks: a) competences; b) bodies of knowledge; c) education and training; and d) ethics. *Competences* are primarily concerned with workplace skills, which can be practically demonstrated; *education and training* are concerned with improving consistency and standards, in some cases through certification; *bodies of knowledge* involves developing an agreed core structured knowledge reference; and *ethics* is about improving the level of ethical behaviour, oversight and responsibility within the ICT profession.

The European Commission’s policy drive for developing ICT professionalism, as part of the overall Digital Europe Strategy (The European Commission, 2019), aims at maturing these building blocks in an integrated way. The key question, however, is: how exactly can these building blocks be integrated both conceptually and in practice? It is not too difficult to integrate a competence framework into a training programme (Sanz et al., 2018) nor is it problematic to consider how to use a Body of Knowledge as part of developing competences. Ethics, however, does present a challenge in terms of integration, as it appears to have important differences from the other types of professional knowledge. The path is less clear than the other aspects of professionalism as people can disagree on ethical priorities and there are some cultural differences (Sherry, 2013). A recent review of ethics as part of ICT policy revealed both core agreements and differences, for example, even within the EU the former Eastern bloc countries can have different perspectives than some Western European countries (Thornley et al., 2018). Indeed, dilemmas and complexity are often highlighted as key parts of ethics and ICT (Runciman, 2019; Thornley et al., 2011). Regulating the ethics of emerging professions can also be seen as a challenge to their independent professional status in some cases (Eraut, 1994) and can be a difficult balancing act.

2.2 Bodies of Knowledge

Part of KM is about enabling knowledge sharing through effective codification. Bodies of Knowledge (BoKs) are explicitly designed to model, codify, and share common core agreed knowledge areas (KA), normally for specific professional groups. In terms of their content structure, they generally contain a section explaining the purpose, scope and intended audience. Knowledge they describe/define is grouped into categories/areas and subdivided into further knowledge items (KI) or units (KU). They exist for many professions but are normally only discussed or critiqued when a nascent profession feels it needs one, e.g. recent work on requirements engineering (Penzenstadler et al., 2013), or when a major update is required, e.g. project management (Morris, 2001).

They are explicit knowledge in terms of Nonaka’s (1994) distinction between explicit and implicit or tacit knowledge, as they are always written down or ‘codified’. At the same time, they draw heavily on tacit knowledge as they are typically devised through consultation with experts. The method of their development generally involves a literature review of key sources to identify topics and new trends and then a consultative period (Sefton, Shea and Hines, 2011) to consolidate and attempt to reach consensus. While there is no single agreed method for development, this broad outline is used as a common approach (Morris, 2001; Morris et al., 2006) though different professions rarely acknowledge methodological input from other professional BoKs. So

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far in our literature review, we found no real input in BoK development from KM expertise on knowledge codification, such as expertise on improving elicitation methods (Gavrilova and Andreeva, 2012).

BoKs are not a current phenomenon but are discussed in an historical sense when studying books or artefacts that represent specialised knowledge such as shamanism (Rutz, 2013). They are often afforded a kind of reified status and are described as ontologies, ‘representations of’, and in some cases, have an almost totemic status (Durkheim, 1912) in symbolically externalising the shared identity of a profession. This is particularly notable in the rhetoric of BoKs in emerging professions, such as massage therapy (Sefton, Shea and Hines, 2011). They can be linked explicitly to the human body as part of a critique of the tendency to focus on learning and knowledge as purely cerebral rather than embodied (Peters, 2004; Claxton, Lucas and Webster, 2010). Indeed, the term ‘Bodies of Knowledge’ as opposed to, for example, Knowledge Reference Guide, does perhaps indicate that BoKs suggest an incorporation of knowledge into practice and a group.

BoKs concern issues of identity, developing or furthering professionalism and, in some cases, claiming and disseminating knowledge by formerly marginalised groups. A strong example of this is the women’s movement in the 1970s. Up until that time, medical knowledge about women’s bodies was owned and controlled by the predominantly male medical establishment. The seminal book ‘Our Bodies Ourselves’ (Davis, 2007; BWHB, 1971), was developed and published by women in an accessible form, which also incorporated the lived experience of women’s embodied lives. Both the book and the associated discourse around its publication are fascinating examples of the role formalising knowledge can have in creating shared identity and empowerment. Thus, whether BoKs formally include ethics within their structure or not, they often have a value driven motivation in their formation, development, and dissemination.

Finally, BoKs are part of a wider domain knowledge infrastructure, being increasingly linked to competence development through links with curricula and competence frameworks (Morris et al., 2006) for their related professions. This increases the potential role of ethics in BoKs, as there is a push from educators and employers to incorporate ethics in professional education. This is partly due to decreased public trust in professions *per se* and how high profile disasters (Gelles, 2019) and privacy leaks have decreased public trust in the ICT profession. For example, the IEEE has recently completed extensive work on ethics for AI and autonomous systems (IEEE, 2020), in response to growing public disquiet. The IEEE’s initiative incorporates educational guidance and is moving towards certification. The recently updated European e-Competence Framework (2019) also now includes ethics as a transversal skill. These developments are not without dissenting voices, such as recent discussion on the validity and usefulness of the SCRUM Body of Knowledge (Kim, 2020) and the ongoing debate on the validity and objectivity of the Psychiatry Profession’s Classification Manual of Mental Disorders (Spiegel, 2005).

2.3 Ethics

Ethics generally concerns the study of what is right or wrong (or morals), why that might be so, and how humans engage with these concepts (Rachels and Rachels, 2019). This includes understanding systems of values, their application, and resulting implications. It has a long history of study within philosophy and can be broadly grouped into three main approaches: virtue ethics; deontological ethics; utilitarianism/consequentialism. Virtue emphasises moral character and was initially developed by Aristotle (350BC). Deontology emphasizes duties or rules and following those rules regardless of consequences. Finally utilitarianism (Mill, 1863) or consequentialism emphasizes the need to weigh up the positive and negative consequences of actions before deciding what is the right course of action to take (Hursthouse and Pettigrove, 2018).

Depending on which approach is taken, there are different perspectives on what knowledge about ethics might be. In virtue ethics, it is primarily about implicit aspects of a person and their identity that guide behaviour, suggesting education and mentoring might be the best approach to impart knowledge/values and fully integrate it into a person’s mindset and practice. In a rule-based approach, it suggests developing guidelines incorporating the correct ethical approach, and then ensuring everyone knows the rules and is compliant with them. This can include formulating and formalising ‘code(s) of ethics. It may also include encouraging compliance by linking ethics codified in BoKs to graduate certification or even accreditation of the educational institute itself (i.e. curriculum must be based on BoK of which ethics is part – e.g. (ACS, 2015)). The consequentialist approach requires the ability to weigh up the likely implications of actions, so it is in one sense knowledge or data driven.

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This is not straightforward, however, as the knowledge required to correctly assign ethical actions in different possible scenarios is different from gaining knowledge about what those scenarios may be.

Thus, we can see that one's view of what ethics is affects the approach to improving ethical standards within a profession and how one might include ethics in a Body of Knowledge. It can also be dependent on one's view of the nature and role of a profession in relation to tackling ethics. The link between individual understanding and values, social or professional norms and the connection between knowledge and practices are complex factors, which influence how knowledge about ethics plays out in a profession.

3. Method

3.1 What was reviewed

Key criteria for inclusion were authority i.e. the BoK is from an established and known institution and availability i.e. it is possible to locate and access the BoK. A review of significant ICT BoKs involved initial selection through a literature search using the search terms 'BoK', 'Body of knowledge, or 'Bodies of Knowledge', combined with different ICT related terms, ranging from broader (ICT, IT, computer, software etc.) to narrower terms (project, data, service, security etc.) to ensure comprehensive coverage. This was extended through searching websites from authoritative bodies and sources in the field. Authoritative bodies, for example ACM, IEEE, ACS and CIPS, in some cases have their BoKs integrated in official exams supported by legal regulations at national level. In other cases, authoritative sources by educational institutions or by professionals in the field were looked at, e.g. PMBOK, SWEBOK. These BoKs dictate what is considered relevant knowledge. The results were verified through two stakeholder meetings with experts in the ICT professionalism field who were selected on the basis they had published on the topic or contributed as experts to previous EC ICT Professionalism projects. Thus, the list cannot claim to be exhaustive, but it is reasonably representative.

Twenty-three BoKs were analysed in total with 6 BoKs in the generic level of ICT management and 17 in more detailed specialist areas. This distinction is important, firstly because as ICT has many different specialisms, more specialist BoKs can be found than generic BoKs. Secondly, because when analysing the 'spread' of ethics in the field of ICT, i.e. the level that ethics has permeated this professional field, distinguishing specialist versus generic BoKs is useful. Distinguishing between generic and specialist BoK allows exploration of questions like: is ethics considered a relevant topic at a generic level or at specialist level? and, is there a difference between specialist areas in the acknowledgement of ethics? Finally, as BoKs are often part of a suite of resources for a profession (i.e. knowledge infrastructure) including other items such as competence frameworks, codes of ethics and certification programmes, we also noted if the BoK referred to ethics material in related resources.

3.2 How were they analysed?

Our RQ provided the basis for content analysis of retrieved BoKs. The aim was firstly to ascertain where ethics was overtly incorporated within the overall content structure i.e. scope, introduction, KI/KU etc. Then to examine in what way, i.e. in definitions and concepts, and links to the domain knowledge infrastructure. We reviewed whether ethics was included as core to the BoK, i.e. was ethics included as a knowledge item or knowledge unit within the knowledge structure. We then examined where ethics was mentioned in other parts of the BoK, for example the introduction or purpose section. The final analysis looked at how the BoK linked ethics to the domain knowledge infrastructure, i.e. to other professional resources such as codes of ethics, or incorporation into a professional certification process.

4. Results

Table 1 shows the results from the initial analysis and provides an overview of the BoKs surveyed, whether and how they included ethics, and if there were other ethics content sources available such as a code of ethics and/or guide to professional conduct. The main finding is that all but one of the BoKs we surveyed did include ethics in some way, the only exception being the 'Enterprise Architecture Body of Knowledge'. Even in this case the BoK mentioned ethics as important which would be developed in the future. We then carried out some detailed analysis of the BoKs that included ethics, to ascertain if they could be usefully further categorised. We examined them to see where and how exactly ethics was discussed in the BoK. The results show the following key findings:

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Findings related to ethics within structure of BoK

- Ethics is most commonly a knowledge unit (18/23)
- Ethics in over half of BoKs is included as part of introduction/purpose/overview (12/23)
- Ethics is rarely the heading of a general knowledge area (4/23)

Findings related to ethics within definitions and concepts of the BoK

- Ethics is rarely explicitly linked to leadership (2/23)
- Ethics is sometimes included in definition of professionalism (5/23)

Findings related to link of ethics in BoK to other professional resources or processes

- Ethics is included in definition of professionalism, 3/5 include ethics as part of their certification process
- The 2 that include professionalism but do not certify ethics have no certification process at all

BoK Title	Ethics included in BoK?	Ethics as KA/KU/KI in BoK?	Ethics in other parts of BoK?	How is ethics included in other parts?	Ethics related sources in literature?	BoK linked to certification?	Ethics part of certification?	Separate code of ethics/ conduct?	Code of ethics mentioned in BoK?
GENERAL BOKs									
Core Body of Knowledge for ICT Professionals - ACS, 2015	✓	✓	✓	In definition ICT profession	n/a	✓	✓	✓	✓
Common BoK for Computing and ICT - CIPS, 2012	✓	✓	✓	In vision of BoK, in definition ICT professional	✓	✓	✓	✓	✓
Digital Practitioner BOKs - TOG, 2019	✓	✓	✗	n/a	n/a	✗	✗	✗	n/a
The European Foundational ICT BoK - EC, 2015	✓	✓	✓	In definition ICT professional	n/a	✗	✗	✗	n/a
Domain description bachelor of ICT - HBO-I, 2019	✓	✓	✗	n/a	n/a	✗	✗	✗	n/a
Computer Science BoK - ACM/IEEE, 2013	✓	✓	✓	Work ethic critical; part of curriculum. Professional responsibilities	n/a	✗	✗	✓	✓
SPECIALISED BOKs									
Business Analysis BoK v3 - IIBA, 2015	✓	✗	✓	As behavioural characteristic in competences: Short description.	n/a	✓	✗	✓	✗
Business Process Management Common BoK 3.0 - ABPMP, 2013	✓	✗	✓	Code of ethics: practical description of responsibilities	n/a	✓	?*	✓	✓
Cyber Security BoK 2.0 - NCSC, 2017	✓	✓	✓	ethical responsibilities', ethical hackers	✓	✗	✗	✗	n/a
EDSF Data Science BoK v2 - IABAC, 2019	✓	✓	✗	n/a	✗	✓	✓	✗	n/a
Enterprise Architecture BoK - EABOK Consortium, 2014	✗	✗	✗	(Code of ethics important in future)	✗	✗	✗	✗	n/a
Enterprise Information Technology BoK - IEEE/ACM IT, 2017	✓	✓	✗	n/a	✗	✗	✗	✗	n/a

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BoK Title	Ethics included in BoK?	Ethics as KA/KU/KI in BoK?	Ethics in other parts of BoK?	How is ethics included in other parts?	Ethics related sources in literature?	BoK linked to certification?	Ethics part of certification?	Separate code of ethics/ conduct?	Code of ethics mentioned in BoK?
IT Architecture BoK 2.0 - IASA, 2019	✓	✓	✗	n/a	✗	✓	?	✓	✓
IT Security Essential BoK - U.S. Dept.Homeland Security, 2007	✓	✓	✗	n/a	n/a	✗	✗	✗	n/a
Open Service Management Foundation BoK - OSM Alliance, 2017	✓	✓	✗	n/a	n/a	✗	✗	✗	n/a
Project Management Professional BoK 6 - PMI, 2017	✓	✓	✓	Term used in factors. Being ethical as quality of a leader.	✓	✓	✓	✓	✓
Quality BoK - ASQ, 2009	✓	✓	✗	n/a	n/a	✓	?	✓	✗
Scrum BoK 3.0 - SCRUM study, 2016	✓	✓	✗	n/a	n/a	✓	?	✗	n/a
Software Engineering BoK - IEEE, 2014	✓	✓	✗	n/a	✓	✓	?	✓	✓
Systems Engineering BoK - IEEE, 2018	✓	✓	✓	Term mentioned in knowledge areas	✓	✗	✗	✓	✓
The Information Management BoK - Bytheway, 2014	✓	✗	✓	Ethical principles as part of case example	n/a	✗	✗	✗	n/a
Usability BoK - UXPA, 2012	✓	✗	✓	Terms 'ethical considerations' and 'ethical issues' used	n/a	✓	?	✓	✗
Wireless Engineering BoK 2 - IEEE, 2012	✓	✓	✗	n/a	✗	✗	✗	✓	✓
Total (out of 23 BoKs)	22	18	11		5	11	4	11	8

Table 1: Overview of BoKs and ethics (**"n/a": item not applicable i.e. non-existent. ***"?": no data could be found)

5. Analysis/Discussion

This section analyses and discusses findings in the context of our research question and suggests how they relate to some of the issues of power and identity raised in the literature review. In terms of our RQ *how is ethics codified within the content structure of professional bodies of knowledge?*, we found two main approaches to including ethics in ICT BoKs, which are combined in some cases.

The first approach includes ethics within the structure of the BoK as a general Knowledge Area (KA) or, more commonly, as a specific Knowledge Unit (KU) or Item (KI). This approach positions ethics as an essential piece of knowledge *within* the BoK, but it remains subordinate to the knowledge structure rather than being an overall or generally applicable concept. In most cases, where ethics was addressed within a KI or KU, the term is just mentioned without any further explanation or discussion. Only CyBOK and SEBOK devote a complete section with a more detailed description of ethics as a KI. Including ethics as a Knowledge Area brings it up a level of abstraction, strengthening its position and increasing visibility and coverage, though this approach is rare.

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As a second option, ethics may be included as part of the introduction, mission, or purpose of the BoK. In this case, ethics is presented as a general context but is not intrinsically incorporated into the core of the BoK. Rarely, with the ACS BoK being the best example, is ethics both discussed in the mission, and identified as a core and common required knowledge area.

How can these approaches best be categorised and understood? We argue that the nature and maturity of a profession will provide a useful lens to categorise different approaches to incorporating ethics in BoKs. How a profession deals with knowledge and how it integrates this into its other structures is a sign of professional maturity. Acknowledging ethics as part of its professional knowledge is an important starting point. At the higher end of maturity, BoKs that include ethics in both their definition of professionalism and their certification and educational resources have more effective ways of sharing knowledge about ethics within their field.

What guidance could KM provide to Body of Knowledge developers on codifying knowledge about ethics? The development of BoKs do not generally follow any process or method that uses expertise from KM in terms of knowledge codification or structure and the approaches to incorporating ethics varied. It would appear to be useful to have a broader discussion between different BoK creators so lessons could be learnt, and consistency improved. Within KM knowledge codification techniques, knowledge as part of learning organisations, and issues of power and knowledge are more developed than in the BoK development field so some interchange would improve maturity of BoK development processes.

6. Conclusions and future work

BoKs are an interesting area of KM, both very concrete and practical, as well as highly abstract. Knowledge is seen as part of what it is to be a professional, in this case, an ICT professional. The codification of that knowledge is an attempt to make this knowledge explicit. Ethics are also a significant element of professional identity and therefore, are considered as something to be included in BoKs as a codification of knowledge. How this is achieved is not necessarily consistent, nor always explicitly considered. We found that, for example, whilst current BoKs usually have an Ethics Knowledge Item or Unit, there is variation in the depth of content covered. BoKs are also often developed for each profession (or indeed, sub-sections of a profession) independently. There is an increasing rise of new professional areas of knowledge, particularly within the ICT field, and as these professional areas begin to develop their own identity, they begin to develop their own BoKs. KM could play a stronger role in optimising the method(s) of BoK creation and providing a shared approach to incorporating ethics. This will not be straightforward as professional knowledge is often disputed, and issues of power and identity will surface.

Although this current study began the work of identifying the prevalence of explicit ethical knowledge in ICT BoKs, our review provides insight to further analyse BoKs more closely in relation to how different ethical approaches (i.e. virtue, deontological and consequential) are considered and addressed. Future work should examine the attention, weight, and completeness with which BoKs address these approaches. Our literature review also identified issues around power, value informed development, and knowledge embodiment as more macro and opaque but relevant ethical considerations of BoKs. Once you are putting knowledge in a book and calling it a BoK (i.e. representing the core Knowledge and values of a profession or group), you are making or reinforcing a value informed ethical statement concerning legitimacy in producing society. Humans live and work in groups, develop complex knowledge and organise value-based systems to manage that. Revealing and scrutinising the ethical positions and possible interpretations, claims and competing tensions within BoKs and how this is disseminated wider into professions would be a worthwhile future research endeavour. For example, the 'Core BoK for ICT Professionals' (ACS, 2015) recommend that the KI, 'IT Governance and Organisational' principles should promote 'moral' behaviour. They also include 'ethics' and 'societal issues' as KI's. In the latter case, knowledge of environmental sustainability is not specifically mentioned contrasting with 'The European Foundational ICT BoK' (EC, 2015), which does.

Finally, this current study focused on revealing overt ethical knowledge embedded in ICT BoKs, yet there are more mature professions and related BoKs with which to compare. Future research could concern the comparison of domain specific BoKs in relation to their nature, maturity, and ethical treatment, as well as how they have been studied in the literature in relation to ethical considerations. For example, is ethics in professional BoKs generally linked-to/embedded-in professional practice or do approaches differ depending on

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the professional field and its maturity? Further research may well arm researchers interested in ethical considerations of ICT BoKs with additional techniques and knowledge.

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