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Research article

Development of a holistic model for the management of an enterprise's information assets

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ABSTRACT

Organisations increasingly realise that they must transform into true digital enterprises to create competitive advantage and ensure corporate survival. However, many organisations do not realise that successful digital transformation (DT) requires much more than technology; it can only succeed if they manage their data, information and knowledge as true business assets. This paper describes collaborative research conducted by academic and industry partners, a mutually beneficial journey spanning the past ten years. The aim was to develop a Holistic Information Asset Management (HIAM) model indicating the important areas of information asset management (IAM) that support the DT journey. Interviews were conducted with C-level executives in organisations from all industries on three continents to investigate their IAM practices, the barriers to good IAM and the benefits of managing information assets (IAs) well. This paper proposes that organisations should focus on ten domains in their quest for effective IAM: i) business benefits, ii) business environment, iii) executive awareness, iv) leadership and management, v) information environment, vi) information systems, vii) information behaviour, viii) information attributes/quality, ix) information performance and x) justification.

1. Introduction

Senior managers and boards are accountable and responsible for effectively deploying the assets and resources of their organisations. These assets consist of financial (working capital and annual budget), physical (equipment, buildings, office furniture, computer hardware and software), human and information assets (IAs), which Evans and Price (2012) define as all data, documents, content and knowledge. Research has proven that the wealth-creating capacity of organisations is no longer based on tangible assets alone, but that the IAs are critical to every business activity, every business process and every business decision of every organisation (Freeze & Kulkarni, 2007; Jhunjhunwala, 2009; Salamuddin, Bakar, Ibrahim, & Hassan, 2010; Wilson & Stenson, 2008). IAs are becoming increasingly important in a complex digital environment where organisations have to digitally transform to take advantage of new and innovative technologies, improve the experience of increasingly demanding customers and clients, improve operations, innovate, improve decision-making and realise competitive advantage (iScoop, 2019; Larrivee, 2018; Ocean Tomo, 2017). It is therefore incumbent upon organisations to manage their IAs well.

It is important to note that IAs are different from Information Technology (IT) and that this paper refers to the management of information, not technology. Information Technology is managed by the IT Department that "owns the systems that are used to store and transmit IAs" (Logan, 2010) and that is measured on throughput and uptime. On the other hand, IAM relates to creating and using the IAs (Ceeney, 2009). Business decisions are not based on the availability of technology; they are made on the information delivered by the technology. The business practitioners who produce and use the information inherently know its value, understand what contribution it makes to the business and are vitally interested in the quality of the information. The IAs should therefore be owned and managed by the business. However, it is often difficult to get business people to articulate their information needs. They do not wish to waste time performing IAM tasks (Evans & Price, 2018). In Logan's words, "And so the circular argument begins: it is not my job, IT should do it, by which they mean buy more storage and get us that piece of magic software that will fix the problem once and for all". Logan adds that, unfortunately, IT has a poor track record of success in managing IAs.

Despite the increased understanding of the value of information and the business benefits of improved IAM, research (Evans & Price, 2012; Logan, 2010) shows that these assets are often not managed effectively, because of a lack of accountability and unenforced responsibility. Limited research has been done on the reasons why IAs are not

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managed with the same rigour as other assets, e.g. financial assets. The IAM problem persists, and enterprises have been grappling with it for years, but digital transformation has changed the scale and nature of the information management challenge and highlights the critical role of high-quality IAs as an antecedent for success (Larrivee, 2018; Roe, 2019; Smith, 2016).

This paper describes many years of combining industry experience with formal empirical research to identify the IAs in the organisation, how important those IAs are to the organisation, how well these assets are managed and what areas of practice need to be addressed to improve IAM. The product of the study is a holistic model indicating the important areas of IAM that will support the digital transformation journey.

2. Literature review

The management of data, information and knowledge has been an important part of the research landscape over the years. Different topics that have been investigated by pioneers in the field include the improvement of data and information quality, different ways to manage tacit and explicit knowledge in organisations, suggestions about monetising data and information and including IAs in accounting reporting, as well as information security. This research increasingly referred to the need for information to be managed and exploited to enhance productivity and profitability. As technology advances, competition becomes fiercer and customer/client expectations become more demanding, organisations realise that they must undergo digital transformation to survive. Research on the digital transformation of the organisation regards information even more intensely as a vital asset and states that a digital workplace calls for a unified, enterprise-wide approach to IAM. This means that organisations rely on effective IA governance and management every step of the way. Literature described in the next section emphasises the view that managing information as an enterprise asset is becoming more important than ever before.

2.1. Information assets

Research refers to non-tangible assets as information assets, knowledge assets, intangible capital (Fincham & Roslender, 2003; Lev, 2001; Tomer, 2008), intellectual capital, intellectual assets (Bismuth & Tojo, 2008; Litschka, Markom, & Schunder, 2006) and knowledge resources (Grover & Davenport, 2001). These intangible assets are different from most other resources, as their value cannot easily be quantified and depends on context and use. The potential value of an Information Asset is therefore not a reliable indicator of its actual value; if the value is never crystallised, there is no benefit to the organisation. The economic value of information is often understood in terms of deprival value, that is, what would the organisation lose and what would be the consequences if it were deprived of the information (Young & Thyil, 2008). Intangible assets contribute to the organisational strategy (Steenkamp & Kashyap, 2010), but they are not recognised and disclosed in the balance sheet (Laney, 2018). The accounting rules do not allow these intangible assets into the balance sheet, even when they are a main source of value in a business (Laney, 2018). Higson and Waltho (2009) agree that, although IAs are hard to account for, they have significant potential benefits and "just because intangibles cannot be counted on the balance sheet does not mean that they do not count and should not be counted". A focus on business benefit is especially applicable to enterprise information where the cost of information is often high and there is a growing need to justify such costs by regarding information as a strategic and important business asset (Evans & Price, 2012).

2.2. The importance of IAs

Information Assets have been described as "the only meaningful resource" (Drucker, 1993), "today's driver of company life" (Bontis, Dragonetty, Jacobsen, & Roos, 1999), "the indisputable value drivers to success" (Jhunjhunwala, 2009) and the "most important production factor" (Steenkamp & Kashyap, 2010). Chen and Lin (2004) emphasise that the value created by intangible assets (such as human capital) are not less than that created by tangible assets (such as machines). Intangible assets can enhance business performance (Bedford & Morelli, 2006; Choo, 2013; Ladley, 2010; Schiuma, 2012; Willis & Fox, 2005) and create competitive advantage by enabling cheaper or more differentiated products (Citroen, 2011; Porter, 1980). IAs should therefore not be treated as an overhead expense, but as an important contributor of business benefit (Evans & Price, 2016; Laney, 2018; Schiuma, 2012).

In the digital era, it is increasingly recognised that IAs contribute to sustainable competitive advantage (Parsons, 2013). Modern research (iScoop, 2019; Roe, 2019) refers to IAs as a key part of digital transformation, as it impacts every step of the digital transformation journey. According to Smith (2016) a true digital business must focus on consistency and availability of information, with the end goal of enhancing the customer experience. Information should be in context as well as consistently captured and managed. Information that is real and people-centric will empower contextual business decisions. Without an understanding of the important role of IAs, digital transformation efforts therefore cannot succeed. Organisations cannot impact the customer's digital experience without digital information; knowledge workers cannot do their jobs without the right access to the right information at the time they need it; process automation cannot happen without digital information. Information is therefore inextricably linked to digital transformation (Smith, 2016). Larrivee (2018) supports this view by referring to information as the 'currency' that fuels and funds digital transformation.

2.3. Information asset management (IAM)

As the business landscape is becoming increasingly complex, organisations need to develop new capabilities, including the capability to effectively manage their data, information and knowledge. The term '*information asset management*' refers to the processes and procedures used to deploy IAs to derive meaningful business insights and deliver those insights to consumers at the right time in the right format (Bhatt & Thirunavukkarasu, 2010). IAM ensures that data, information and content are treated as assets in the true business and accounting sense and avoids the risk and cost associated with misuse of data and content or exposure to regulatory scrutiny (Ladley, 2010). As IAs are the primary drivers of business performance (Bismuth & Tojo, 2008) that enable every business activity, every business process and every business decision, it is critically important that IAs such as data, documents, content on web sites and knowledge are understood and managed well. IAM affects businesses on many levels, including employee satisfaction and retention, profit margins and productivity (Roe, 2019). More efficient and effective deployment of IAs can increase revenue, reduce cost, improve profitability, mitigate risk, improve compliance and increase competitiveness (Bedford & Morelli, 2006; Oppenheim, Stenson, & Wilson, 2001; Young & Thyil, 2008). IAM also supports collaboration, as people from different parts of the organisation can collect mutually beneficial information (Bedford & Morelli, 2006).

IAM is referred to as one of the 'success pillars' of a digital transformation or enterprise-wide change project (iScoop, 2019). Smith (2016) posits that a true digital business focuses on consistence and availability of information, with the end goal to enhance the customer experience. He added that 'information-enabling' every part of a business allows enterprises to scale digitally in a way they could never do before. Improving IAM practices should therefore be a key focus for many organisations today, across both the public and private sectors.

Everyone in an organisation, especially executives, should therefore understand the importance of effective IAM to their organisation (Abrahamson & Goodman-Delahunty, 2013; Oliver, 2011; Widén & Hansen, 2012). Without that understanding, there is little chance of strategies being implemented successfully (Swartz, 2007) especially the digital transformation strategy.

Although IAM is at the centre of digital transformation, "the link between digital transformation and information management is often not made" (iScoop, 2019). Organisations recognise that data, information and knowledge are the lifeblood of a business, yet most organisations still do not manage their IAs with the same discipline and rigour as that with which they manage their other business assets. If a typical organisation was to manage its money the same way as it manages its information, it would not survive. In addition to hidden value and significant risks, this results in foregone revenue, in avoidable cost, in unrealised profit, in lost productivity, in unmitigated risk and in suboptimal staff morale (Evans & Price, 2018).

2.4. Barriers to effective IAM

Various researchers have attempted to find reasons why data, information and/or knowledge are not managed effectively. Evgeniou and Cartwright (2005) identified three categories of barriers to the effective deployment of IAs, namely behavioural, process and organisational barriers. Hong, Suh, and Koo (2011)) refer to the key challenge to encouraging knowledge sharing as 'individual barriers' such as resistance, trust, motivation, a gap in awareness and knowledge, and 'organisational barriers' such as language issues, conflict avoidance, bureaucracy and distance. Other researchers (Hase, Sankaran, & Davies, 2006; Khakpour, Ghahremani, & Pardakhtchi, 2012; Zyngier, 2002) found that the barriers to knowledge transfer and sharing are time limitations, lack of awareness about knowledge management and its benefits, lack of top management support, lack of funding, an unclear strategy, weak IT support, unclear information demand culture, unbalanced effort versus reward, technology and knowledge complexity, lack of trust, ineffective communication and inadequate information systems. According to Logan (2010) the lack of awareness is mostly due to a lack of formal education in information management.

Several authors refer to a lack of 'information culture' that supports information sharing and management (Abrahamson & Goodman-Delahunty, 2013; Oliver, 2011; Widén & Hansen, 2012). De Long and Fahey (2000) identified the impact of organisational culture on the management of knowledge assets. According to them, cultures - and particularly subcultures - heavily influence what is perceived as useful, important or valid information and knowledge in an organisation. Managers often have no difficulty in perceiving the advantages of IAM, but this is not sufficient to persuade them to make the necessary effort and investment to adopt the concept.

According to Willis and Fox (2005) corporate governance refers to the processes by which organisations are directed, controlled and held to account. Information is a vital element of corporate and asset governance and a robust information management policy should form part of a company's corporate and asset governance and risk management plans. This governance will ensure that information is managed in an agreed, documented, controlled and appropriate way to ensure transparency, accountability, compliance and security. Cutting and Kouzmin (2002) and Young and Thyil (2008) emphasise that executive boards should ensure continual learning by asking pertinent questions and maintaining a spirit of enquiry. However, boards often have experience of finance, marketing and manufacturing, but rarely have experience of information management; they do not understand the importance of measuring and managing IAs as actively and carefully as traditional assets (Citroen, 2011). The quality of the information used by the board is an important condition for trust in strategic decision making. Correct strategic decisions can only be taken on correct and complete information. Boards are often not provided with good quality information to make strategic decisions, as managers only provide information in response to direct questions from the board (Citroen, 2011; Evans & Price, 2016). An August 2013 study by Harvard Business Review confirmed that many business decision makers are feeling undermined by inaccurate, obsolete and hard-to-access data.

The literature review provided the basis for the interview protocol, with which the IAM practices in organisations and the barriers to effective IAM were identified and investigated. The research methodology deployed for the empirical research, with the purpose of developing a holistic IAM Model, is described next. This section is followed by a comprehensive description of the way the model evolved through the research.

3. Research methodology

The research described in this paper was conducted collaboratively by both academic and business representatives and was designed to augment anecdotal evidence and industry experience (Experience Matters, 2019, www.experiencematters.com.au) with formal ethics approved, rigorous and validated academic research. The researchers gathered the opinions and experiences of executives and board members regarding IAM in their organisations. Although IAs are obviously used and managed by employees and managers on all levels of an organisation, C-level executives and board members were chosen as research participants for the development of the model, as they have greater visibility of the organisation as a whole and the 'big-picture' topics of business governance, justification of IAM investment initiatives and crystallisation of benefits. It is on this level that information-awareness is lacking. Furthermore, ineffective IAM should be addressed at executive level.

Personal interviews were conducted by the authors between 2009 and 2019. The interviewees included board members and Chief Executive Officers (CEO), Chief Financial Officers (CFO), Chief Information Officers (CIO), Chief Knowledge Officers (CKO) in organisations of all sizes in both private and public sectors in Australia, South Africa and the USA. The participants represented different industries (e.g. banking, aviation, manufacturing, health, legal) in Australia (29 participants), South Africa (12 participants) and the United States (31 participants). Table 1 summarises the demographics of the interview participants:

The personal interviews were conducted face-to-face and each lasted between forty minutes and one hour. All the interviews were conducted in English. An interview protocol was used to focus the discussion and to promote a consistent approach (Flick, 2006; Miles & Huberman, 1994). The questions were open-ended and discovery oriented. Business questions were asked to provide context, followed by questions about information management and its challenges, as well as probing questions to elicit more detail. Both planned prompts (predetermined) and floating prompts (impromptu decisions to explore a comment in more detail) enabled the researchers to delve into detail as required. The topics of discussion included a description of the data, information and knowledge that are deployed in conducting the business, how well these IAs are managed, as well as the barriers to managing them well.

The interview questions were based around the following topics:

What information assets do you work with in your organisation?

Are these information assets considered valuable in your organisation?

How does your organisation currently manage these assets?

Who is responsible for managing these assets in your organisation?

Does your Board understand Information Assets?

What lessons have you learnt regarding the management of information assets?

Table 1
Interview participants.

INTERVIEWEE	ROLE	INDUSTRY	LOCATION
1.	Data Management	Finance	Melbourne
2.	Managing Director	Recruitment	Adelaide
3.	Managing Partner	Legal	Adelaide
4.	Board	Finance	Adelaide
5.	Chief Financial Officer	Finance	Adelaide
6.	Chief Financial Officer	Utilities – Rail	Adelaide
7.	Chief Knowledge Officer	Utilities – Gas	Adelaide
8.	Chief Knowledge Officer	Government – State	Adelaide
9.	Chief Financial Officer	Finance	Adelaide
10.	Chief Executive Officer	Manufacturing	Adelaide
11.	Chief Financial Officer	Services - Member	Adelaide
12.	Chief Financial Officer	Resources	Adelaide
13.	Chief Financial Officer	Finance	Adelaide
14.	Chief Executive Officer	ICT	Cape Town
15.	Chief Information Officer	Finance - Insurance	Cape Town
16.	Chief Information Officer	Finance	Cape Town
17.	Chief Information Officer	Government – Local	Cape Town
18.	Chief Information Officer	Government – State	Columbia, Maryland
19.	Chief Information Officer	Government – Local	Columbia, Maryland
20.	Chief Information Officer	Government – State	Columbia, Maryland
21.	Chief Information Officer	Hospitality	Columbia, Maryland
22.	Vice President (VP) IT Services	Education – Tertiary	Dallas, Texas
23.	Chief Executive Officer	ICT	Dallas, Texas
24.	Director IT	Manufacturing	Dallas, Texas
25.	Chief Information Officer	ICT	Dallas, Texas
26.	Fellow	ICT	Dallas, Texas
27.	Chief Information Officer	ICT	Dallas, Texas
28.	Chief Executive Officer	ICT	Dallas, Texas
29.	Director Integrated Clinical Services	Health	Portland, Oregon
30.	Vice President Application Development	Transport	Portland, Oregon
31.	Director Management Information Services	Manufacturing	Portland, Oregon
32.	IT Director	Retail	Mooresvilles, North Corolina
33.	Senior Vice President	Finance	Charlotte, North Carolina
34.	Vice President IT	Manufacturing	Fort Mill, South Carolina
35.	Marketing and Brand Strategist	Hospitality	Chicago, Illinois
36.	Principal	Finance	Chicago, Illinois
37.	Media Director and Strategist	Marketing	Chicago, Illinois
38.	Software Executive	ICT	Chicago, Illinois
39.	Sales and Marketing	ICT	Chicago, Illinois
40.	Director Data Governance	Health	Chicago, Illinois
41.	Principal	Finance	Chicago, Illinois
42.	Senior Director	Finance	Chicago, Illinois
43.	Client director	Advisory	Chicago, Illinois
44.	Owner	Legal	Pretoria
45.	Managing director	Legal	Pretoria
46.	Director	Legal	Pretoria
47.	Chairman of the board	Legal	Pretoria
48.	Director	Legal	Pretoria
49.	Lawyer	Legal	Johannesburg
50.	Partner, Knowledge Management	Legal	Johannesburg
51.	Partner	Legal	Pretoria
52.	Chair	Insurance, Defence	Adelaide
53.	Chair	Utilities	Adelaide
54.	Chair	Community Care	Adelaide
55.	Chair	Finance	Adelaide
56.	Chief Information Officer	Legal	Adelaide
57.	Chief Information Officer	Defence	Adelaide
58.	Chief Information Officer	Insurance	Adelaide
59.	Chief Information Officer	Health	Adelaide
60.	Director Learning and Business Knowledge	Government	Adelaide
61.	Chief Information Officer	Education	Adelaide
62.	Managing Partner	Legal	Adelaide
63.	Director	Legal	Adelaide
64.	Chief Operating Officer	Legal	Melbourne
65.	Chief Operating Officer	Legal	Adelaide
66.	Chief Information Officer	Legal	Adelaide
67.	Director, IT and Cyber Security	Government	Maryland
68.	Attorney	Legal	Washington DC
69.	Chief Operating Officer	Legal	Washington DC
70.	Named Equity Partner	Legal	Maryland
71.	Data Management Lead	Legal in Government	Maryland
72.	Lawyer	Legal	Sydney

What are your current issues and challenges (barriers) regarding the management of these assets?

How do you see the future of Information Asset Management unfolding in your organisation?

Each session was audio recorded and transcribed verbatim. During the research attention was paid to the consideration of confidentiality of sensitive corporate information. Consent was sought, confidentiality agreements were signed, security provisions were undertaken, and names of individuals and organisations remain unidentified. Consequently, the participants were willing to participate in open and trusting discussions. Respondents had the opportunity to review the transcripts of their responses as well as the de-identified and consolidated data.

Analysing qualitative data involves significant effort (Flick, 2006; Miles & Huberman, 1994) and before the interviews it is incumbent upon the qualitative researcher to understand how the data will be analysed. In qualitative research it is common practice to identify emerging themes. In this project the interview transcripts were thoroughly reviewed to identify categories of data which support the identification of emerging themes. This was aided by the NVivo 10 qualitative analysis software, and then discussed to iteratively identify common patterns or themes (Strauss and Corbin, 1998). As data gathered from qualitative interviews were compared, they either supported the creation of new categories or provided support for existing categories. As the process was carried out it was incumbent upon the researcher to "… be open to possibilities afforded by the text rather than projecting a predetermined system of meanings onto the textual data" (Thompson, 1997, p. 441). Open coding was used to disentangle or segment the data to produce a set of codes. Axial coding was used to refine and differentiate the categories arising from the open coding, and to identify the categories that were most relevant to the research questions. As a third step, selective coding was used to continue the axial coding at a higher level of abstraction (Flick, 2006). Data-gathering and analysis was regarded as complete when "theoretical saturation" was reached, i.e., when no new categories of data could be identified. The findings that led to the development of the HIAM Model will be discussed in the next section.

4. Findings

4.1. The IAs in organisations

During the interviews, respondents referred to different types of IAs, including structured data, unstructured documents and knowledge in people's heads, which are all included in our working definition. Felsbourg (2017) says that at least 80 % of the average organisation's information is managed as *unstructured* information and therefore this area has become critically important for a successful digital workplace. Specific examples of IAs included email, clients' business information, financial transaction documents, research notes, summaries of projects, billing records, time recordings, reports, curriculum vitae, marketing materials, flyers, web sites, social media, contracts, templates, patents, trademarks and standard operating procedures.

4.2. IAs are important to organisations

These assets are important. The named equity partner of a law firm in the USA commented:

Our job is purely information. On a minute by minute basis, that's all our job is [..] 100 % *of it is information. So how do we find better ways to capture, catalogue, index, store, present our information? It's really key*.

Information is important for decision making. The CIO of an Insurance company commented that "one wrong decision, based on wrong information, can ruin the whole company". The historical preservation of information is therefore fundamental to ensure that information can be found when required. The board member of an Australian water utility experienced a situation in his organisation where important information and knowledge about the manufacturer, warranties and materials was not available due to the resignation and retirement of key staff members, which caused significant financial loss for the organisation.

The sheer volume of information does not mean that it is all valuable:

I don't know and I don't have time to determine what information is of use and what isn't. Our billion-dollar company has 3 million emails a day and only 2% are of value. This does not even include instant messages, projects, videos, et cetera. (CEO, USA)

4.3. IAs are not managed well

The research showed that, although data, information and knowledge are fundamental to organisations, they are generally not managed well. A partner in a South African law firm admitted:

This firm is like a library with no index. You don't know where to start finding something and you can search around forever.

The rigour with which information is stored, maintained and managed is a long way behind that of financial and other assets. When asked whether information is managed with the same rigour as financial assets, a partner in a law firm in South Africa responded: "No, it is like chalk and cheese". The chair of a financial advisory firm in Australia acknowledged that for his organisation "the management of our finances is on tertiary school level, while our information management practices are on primary school level".

The managing partner of an Australian law acknowledged that no one is really accountable for the management of information as an enterprise asset, because nobody is rewarded or punished for ineffective information asset management practices. The managing director of a large South African organisation confirmed:

Do we have a responsible person for managing information and documents? There is definitely no such person. Everybody is responsible for managing their own information. We don't keep record of the information at all.

Investors and Board members typically do not prioritise, or take responsibility for, IAM as illustrated by the following comment from a board member in an Australian law firm:

Board members sitting around the Board table do not see information management as a priority and nobody says, 'hang-on a minute, this is fundamental'. Boards really don't get this, and they need to.

4.4. The important areas of an organisation's IAM practices

Augmenting industry experience with the empirical research resulted in a comprehensive, holistic IAM (HIAM) model consisting of ten domains. These domains represent the important areas of an organisation's IAM practices.

Domain 1: **Business benefits**

The *business benefits* domain describes the business impact of effective IAM, i.e. the potential tangible and intangible contributions to increased revenue, reduced cost, higher profitability, improved risk management and decision-making, streamlined operations and competitive advantage. We describe the model by starting with *Business benefits* because they represent the justification for improving IAM practices.

The research participants identified a stumbling block to the introduction of IAM into organisations, namely that the benefits are often

not identified or communicated to executives or staff. The CFO of a services organisation commented that "everybody in this business understands they don't manage their IAs well, but they don't know what the benefit is by actually managing them a lot better". The CIO of a government department agreed that managers need to realise that, with good information asset management, they can make better decisions and show a return on investment. However, the finite quantification of the benefits from good IAM is difficult. The CFO of a financial institution commented that "most people don't like what is nebulous, which is why they struggle with these intangibles". The benefits of IAM are also inter-twined and difficult to crystallise. Information and knowledge only assume value when they affect decision making and are translated into action. It is hard for an organisation to prove that they are managing IAs better than everybody else and that this leads to the business benefit. Yet, potential purchasers expect businesses to show how they manage IAs better than anybody else.

On the other hand, if the benefits are understood, there are positive outcomes. The CKO of a government department believes that organisations can understand the benefits "in reduction of pain". A CEO indicated that, although he cannot put a dollar value on information, he can clearly understand that having the right information at the right time reduces risk and cost. According to a CIO "success breeds success". As soon as people started gaining value out of their IAs, "they are very quick to find other opportunities within their immediate business environment, and then it starts snowballing".

Domain 2: **Executive awareness**

Executives will only be interested if the benefits (domain 1) of good IAM are clearly understood. The *executive awareness* domain assesses the extent to which the board and senior leadership team are aware of, and advocate the importance of, their IAs.

From the research it was found that executives view data, information and knowledge as a vital business asset, yet they do not understand how these assets should be managed and they need to be convinced of the benefits of effective IAM. The Managing Partner of an Australian law firm commented:

> *We are sub-optimal for every day that we are not managing [information] as well as it could be, we're sub-optimal, but does that mean we've got a problem? Not necessarily.*

The lack of awareness is partly due to the lack of formal education in IAM, as well as limited informal on-the-job training and induction. Interviewees commented:

> *I have just completed my MBA and I learnt about everything – strategy, risk, governance, finance, IT, HR, the works, but not a word was spoken about the management of information.* (CIO of a transport company)
> *It [Information Management] is not yet a recognised discipline. People confuse it with information technology, which is not information management.* (CEO, Manufacturing)

A CIO mentioned that managers are removed from IAM the further they move up the management chain. When the Chair of the board of a financial institution was asked whether she would participate in the research project she replied:

> *To be honest, I don't really know much about [information management] and therefore don't really think I can assist you.*

A board member referred to information as *"an amorphous concept that is like a handful of jelly"* and added that people do not know what it is, how to manage it and what the key performance indicators (KPIs) are.

Domain 3: **Business environment**

If the Board and Chief Executive Officer are aware of the importance of effective IAM they will impose effective business governance conducive to managing those assets well. A lack of business governance was identified as an important reason why organisations are not successful in managing their IAs.

> *There was nobody that would take ownership.* (Chief Knowledge Officer, Utilities)

Unlike the Chief Financial Officer, who is accountable for the management of the financial assets, a single person is rarely held ultimately accountable for managing data, information and knowledge as a business asset. Boards and executives also tend to confuse IAM with IT and most don't think about information as being discrete from the IT systems. The CIO is therefore not the right person to be accountable, as they typically have a technical focus:

> *The CIO wasn't interested. It wasn't an issue to him. Nobody had come to him and said you need to get information in order. His focus was on the technology element. For him, his biggest issue was speed and access. That's what he focused on. Not actually the managing of the information and the content.* (Chief Knowledge Officer, Utilities)

Boards do not regard IAM as a board responsibility and prefer to delegate it to management. A director and head of the risk and governance committee of a financial institution declared:

> *As board members our job is strategy and crisis management. Information management is neither strategic nor does it represent a crisis. We are just not interested.*

Domain 4: **Leadership and management**

The research showed that a conducive business environment will enable the organisation's leadership and management to create a culture of managing IAs well. The *leadership and management* domain addresses the organisation's human resources, structure, roles, culture, behaviour and incentives regarding the management of IAs. The structure of organisations often does not include a role of data, information- or knowledge manager. Most of the participants referred to either the librarian or the chief information officer as the custodian or manager of the IAs.

Senior manager support is crucial for creating a culture of valuing and sharing IAs. The Chief Executive Officer (CEO) is often the only person who takes an enterprise view of the organisation, cares about the overall performance and is concerned with the creation of sustainable value. CEOs need to be a visionary and think about data, information, and knowledge on an enterprise-wide basis. These assets should be very important to them. Change needs a champion who is strong enough to pull the organisation through the change cycle, i.e. the champion needs to be an executive manager.

The research indicated that executive support is often absent:

> *We're still not comfortable about the support from the top. There are a lot of good words spoken. A challenge we have at the moment is trying to make sure that at the top they're actually putting the money where their mouth is.* (Data Manager, Banking, Finance& Insurance)

The CKO of a government department believes that executives sometimes understand that information and knowledge is valued for purposes of improving the efficiency and effectiveness of the organisation, but he added: "Would they jump on a sword for that? No". Key performance indicators (KPIs) are rarely imposed and there should be rewards and recognition for managing IAs effectively.

> *We're finding people with just masses of information in their personal drives, just because they've never been told not to put stuff there.* (CKO, Government)

In addition to boards and executive, managers rarely differentiate between the organisation's valuable IAs and the technology that delivers them. They often regard IT infrastructure problems as more critical than information availability. IT is usually seen as a panacea, whilst IAM is ignored. Organisations tend to spend too much on IT infrastructure and software and very little on data management and quality.

Domain 5: **Information environment**

The *information environment* domain addresses the governance of the firm's information ownership, of strategy, principles, policy and work instructions, of security and privacy, and of the instruments required to manage the organisation's IAs. Only with appropriate information asset governance (management policies and other instruments), the IAs will be managed effectively.

The research indicated that few organisations understand what information drives their business and have good information asset governance and management that support the organisation's goals:

> *Not only outside of the organisation, but even within the organisation trying to get everybody to talk the same language in terms of data governance and data management technique. This is why it took 18 months to get our [IAM] policy together in the first place.* (Data Manager, Banking, Finance & Insurance)

The instruments for asset governance, e.g. the metadata model, information register, policies and procedures, et cetera are rarely used effectively. Finding relevant information is a challenge. A managing partner from a law firm said that, until lawyers are forced to operate efficiently, they are actually rewarded for being disorganised.

Domain 6: **Information systems**

The *information systems* domain represents the technical and physical objects and instruments (hardware, software and networks) required to deliver the right information to the right people at the right time. The research showed that without the right information environment (as described above), information systems are unlikely to be usable or fit for purpose. The manager of an HR recruitment company confirmed that they have a database system that does not really work, and their software is also inadequate, as articulated by an executive:

> *It's clunky, it's slow, it's excessively manual in its data input and so forth. We can visualise a system that would be better, but we don't know quite where to find it.*

Another issue is that structured data are often managed with technology, but unstructured data and knowledge are difficult to manage. A CIO from the Australian Health industry commented:

> *"Unstructured information is difficult to manage. There are some clever engines [..] but I've never really seen anything that produces much of use. It always comes back to the fact that information that's not captured in a structured format becomes very difficult to manage. So, the technology has not been particularly effective."*

Managing information as an asset to realise business benefit demands more than merely buying and installing software or hardware. Information and content should also be treated as assets in the true business and accounting sense:

> *If the accounting systems don't create an ability to value Information Assets, then businesses won't.* (CEO, Manufacturing)

Domain 7: **Information Behaviour**

Information behaviour refers to the way people within the organisation work with and manage information. Without efficient and effective information systems, information management behaviours will be poor. If systems are difficult to use, cumbersome and slow, when technologies malfunction, when requested information is not readily available, people will use them sub-optimally or not use them at all, i.e. they will create workarounds. Such workarounds mean that people bypass or undermine the mandated information management practices. Sometimes workarounds are viewed as harmless and essential for performing everyday work. However, the research shows that such poor behaviours result in inefficiencies, duplication, errors and increased risk, as well as hazardous, unethical or illegal violations of procedures and responsibilities (Alter, 2014).

In this research it was found that the barriers mostly related to attitudes and behaviour displayed by employees and managers. This domain is critical for determining the business impact of its information management practices on the firm. The culture of an organisation significantly influences how well information is managed by individuals. Many organisations' IAM culture does not reflect good practice. There is confusion in organisations about the ownership of the information and a lack of discipline in managing information as an enterprise asset. Whereas IAs are the property of the enterprise, employees believe they have ownership of information and store it haphazardly on their on various hard drives and in legacy systems. The CKO of an Australian government department admitted that information is kept in various places on various servers in the company and even stored on old servers that have been archived:

> *It is stored electronically, in hard copy, in different physical places and accessed by different computers on the site and it can't be shared, it can't be found.*

Information is often managed in silos with limited sharing between departments and people sometimes purposefully hide information from their colleagues, as they regard information as a source of power. People leaving an organisation often take intellectual property with them. The chief operating officer of an Australian law firm commented that the photocopying bill increases significantly when a partner leaves because they are copying all their documents to take with them. People resist change as they are afraid of being exposed and their inefficiencies pointed out. The managing partner of an Australian law firm experienced tremendous resistance when he tried to move the company from paper to e-files. He added:

> *"It was extraordinary, as we're only talking about three years ago, not ten years ago. There was an incredible amount of glue between the lawyers and their hard copy files".*

Domain 8: **Information attributes/quality**

The *information attributes/quality* domain addresses the quality of the IAs in terms of availability (can be found in a timely manner), correctness (it matches what it is supposed to be), completeness (information is not missing), currency (it is not outdated for the intended purpose) and relevance or applicability (it is fit for intended purpose and usefully supports employee research, decision making and action).

The research indicated that organisations' data, information and knowledge are often of poor quality. To support decision making and contribute to competitive advantage, processes must be in place to ensure the data are clean and tacit knowledge is captured. If software is automating inefficient and ineffective processes, poor quality data is simply presented more quickly. The CEO of a large health clinic in the US commented:

> *Our technology has improved to the point where I can now receive [bad quality data] at the speed of light.*

The CKO of a large manufacturing organisation indicated that their CIO was very interested in technology, but then realised "our data is rubbish".

Domain 9: **Information performance**

Poor quality information prevents IAs from being effectively exploited and leveraged. The *information performance* domain considers how the organisations' IAs drive business outcomes and to identify further business opportunities.

The research showed that many organisations are not exploiting their IAs to improve business performance and create competitive advantage. The managing partner of a law firm said that 70 % of their 150 fee earners could bill an additional 30 min per day, while 20 % could bill more than an extra hour per day if IAs are more effectively managed. He declared:

> *This now represents our firm's single greatest source of competitive advantage, but if our current IAM practices are disclosed, we're toast.*

Revenue is also gained when high quality information is managed effectively. This is evident in a collaboration between an Indian bank

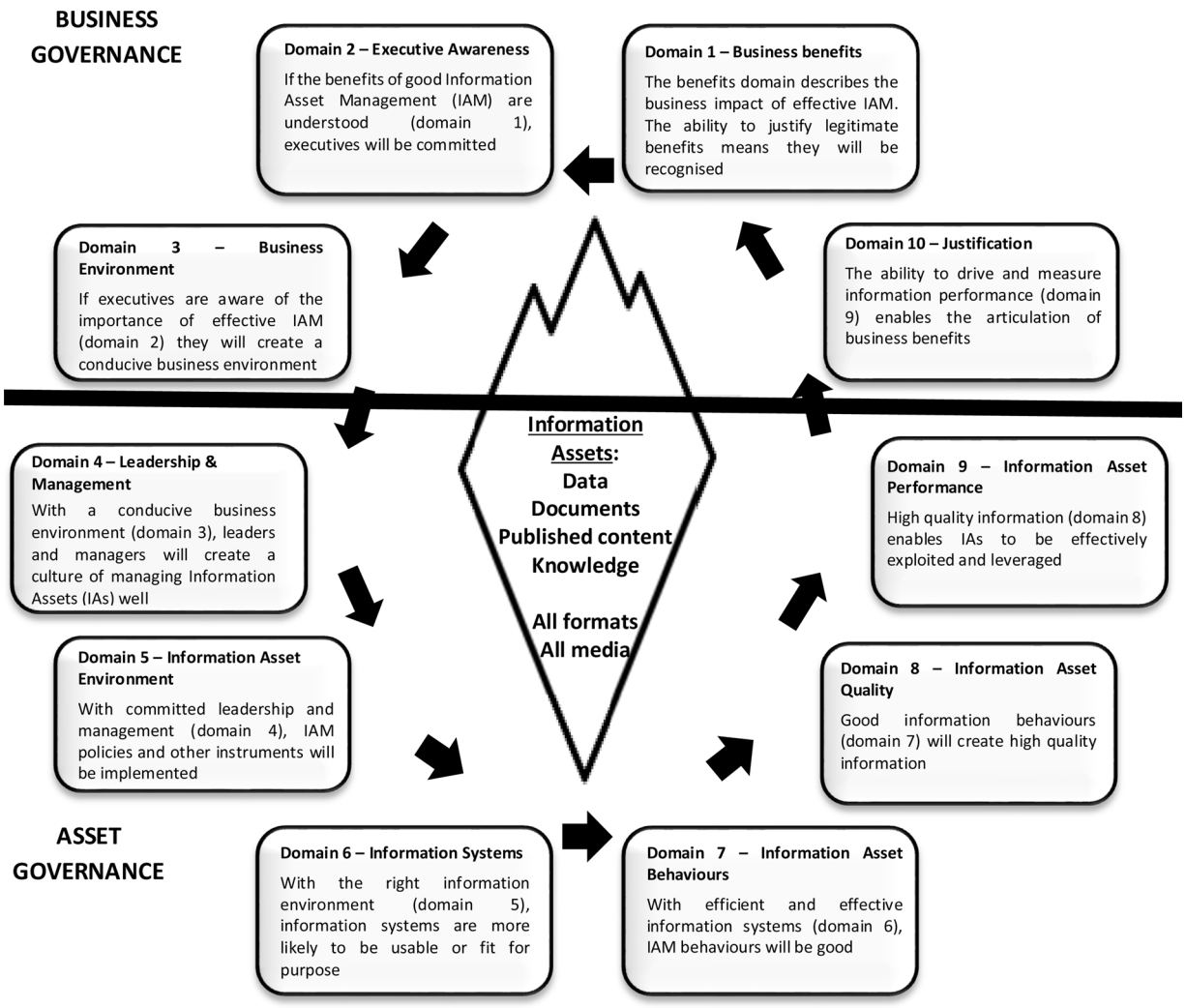

Fig. 1. The HIAM model.

and an Australian insurance company that is selling general insurance products to the savings and loans account holders of the bank. The Board recognised that an insurance company does nothing but manage information and therefore offered the CEO a double-digit bonus for meeting data quality objectives and threatened termination for failure. Within a week a bonus of US$1000 was offered to every branch for hitting data quality targets on three data elements, namely customer first name, customer last name and customer telephone number. The result was that the quality of the organisation's data went from 68 % to between 91 % and 93 % overnight. At the time of the interview, the insurance company was selling 1.7 million new policies per month.

Organisations should understand that if they invest more effort in IAM they will see a return on their investment.

Domain 10: **Justification**

The Justification domain assesses how information management initiatives are justified. An ability to measure information performance (described above) enables the articulation of business benefits.

The research found that most organisations do not have a justification model that allows the funding of continuous IAM improvement. There is no catalyst or incentive to act. Organisations do not realise the risk of not managing their IAs effectively. The managing partner of a legal firm said:

> *I am not sure, even in my own mind, that there is a problem to solve, as a problem implies that there's downside based on the way that the organisation is working now.*

The failure of executive management to perceive the problem prevents high level support for, and funding to, solve the problem. In organisations where the value of IAs is not recognised, it often takes a crisis or severe financial loss to change the attitude. The Managing Partner of a legal firm commented that "if people don't suffer pain, they will not be likely to want to do something differently". The Chief Executive Officer of a large manufacturing company mentioned that they made a large expansion of one of their plants about two years ago and that was the catalyst to try and pull together plant operating knowledge and customer knowledge. They built a business case for a $15 million investment, which was approved, because at that moment they realised how much knowledge they had not captured.

There is a lack of justification to invest time and effort into managing IAs. The reason is that ineffective and inefficient IAM does not necessarily stop a business from running, which decreases its priority and encourages complacency:

> *We can do without [Information management], really. That's not a priority. How's that going to save someone's life?* (CKO, Government)
> *We're not running an oil rig where someone's going to get killed if we don't follow the manual.* (Managing partner, Australian law firm)

In many cases justification is difficult because the organisation does not understand the cost, value or benefit of its IAs. An executive of a US bank commented:

> *The costs of managing information are not understood because they are*

indirect and spread across the organisation.

The value of data, information, and knowledge is temporally, managerially, and professionally contextual. The value is also contextual in terms of level in the organisation (level of seniority) and the functional area, so different groups and individuals have different views of information value.

> *We can't prove that we've actually created value through information management. It forms part of something else and [..] assigning a value to the information management initiative is probably part of the bigger picture.* (CIO, Banking, Finance & Insurance)

The benefits of effective IAM are also unknown. Businesses focus on the tangibles whereas information is a very ephemeral asset and the benefits of IAM are intangible and difficult to quantify.

The justification domain informs the first domain, namely the business benefits domain. With an appropriate justification model, the benefits from effective IAM can be crystallised and recognised. The ten domains are deliberately circular in nature enabling a virtuous spiral from effective information asset management.

The ten domains of the HIAM model and how they relate to each other, are diagrammatically illustrated in Fig. 1 below. The HIAM model can also be used to develop a roadmap to improve the effectiveness of IAM.

5. Conclusions

Information assets have become crucial for organisations' competitiveness and growth. According to Ocean Tomo (2017) in 1975 the intangible assets accounted for 17 % of the Standard & Poor 500 (S&P500) companies' market value, while this number was 84 % in 2015. This is significant, as the S&P 500 index consists of more traditional businesses, as opposed to the NASDAQ index that consists of mostly emerging, technology-based companies. Companies can earn economic returns from IAs and their effective management should therefore be a topic of vital interest to the senior leadership of most organisations. These assets are even more important in the digital economy where organisations need to radically change how they operate and deliver value to their customers and clients (iScoop, 2019). Boards and senior management are well-versed in taking good care of the physical, financial and human assets, but this research supports literature in arguing that hardly any mechanisms are in place for the management of IAs. Governance structures are rarely in place with a single Chief Information Officer who is not only responsible but accountable for how that information is managed. Given that money and information are both acknowledged as vital corporate assets, it is important to know why information is managed differently at enterprise level.

Many organisations do not have a precise and accurate description of their unique activity and they often do not know what data, documents, content, and knowledge are deployed in the conduct of those activities. In many organisations, individuals manage their own information and few people know where critical information can be found, who can access it and how long it should be kept. Whilst they recognise that data, information and knowledge are vital to their operation, organisations do not know how to identify, cost, value, manage, and realise the benefits of, their IAs. Many organisations regard the cost of managing information and knowledge as equivalent to the combined cost of hardware, software, maintenance, support, upgrades, telecommunications, and IT staff salaries, i.e. the cost of procuring and managing the infrastructure, but they do not consider the time that is spent managing information. Few organisations implement a formal benefits realisation programme to measure the return on investment of their IAM initiatives.

Every single individual in any organisation today deals with data, information and knowledge almost every minute of every day, in reports, e-mails, spreadsheets, published content and business conversations. Changing behaviour and improving information practices is imperative; that is, the organisations need to develop a culture where information is valued and effectively managed. IAM is everyone's responsibility; people on all levels of an organisation should manage and leverage information as an asset. To manage their IAs effectively, organisations need to imbue a culture of valuing and managing IAs by, amongst other initiatives, providing incentives and rewards to manage information as an enterprise resource to drive business performance and competitive advantage. Although every employee must take responsibility for IAM, someone needs to be held accountable, for the management of the organisation's IAs. Executives need to recognise the cost and value of their information and the benefits of managing it well. Firms also need to implement appropriate business management tools and solutions that are both effective and easy to use.

6. Recommendations

From the research we suggest that digital transformation of organisations will be supported by implementing the Holistic IAM model to i) measure the maturity of an organisation's IAM and to ii) develop a roadmap to deliver tangible and measurable benefit, both to individuals and to the organisation (domain 1). The executive team should be educated about information as a valuable business asset (domain 2). The board should impose effective business governance over the management of the firm's IAs, by making a single person ultimately accountable for managing this important business asset (domain 3). Effective leadership and management of IAs should be done by designing a vision of the future, imposing key performance indicators on the accurate and timely provision of information and developing and implementing incentives and rewards for good information management behaviour (domain 4). The business environment should be interpreted in terms of IA governance, ownership, strategy, principles, policy and work instructions, security and privacy, and the instruments required to manage the organisation's IAs (domain 5). Appropriate hardware, software and networks are required to deliver the right information to the right people at the right time (domain 6). The organisation should develop a behavioural change strategy and plan to educate all groups about the importance of managing IAs and the benefits of doing so (domain 7). An important prerequisite to effective IAM is that the organisations' data, information and knowledge should be of high quality (domain 8). An organisation's IAs should be put to work to drive business outcomes and identify further opportunities (domain 9) and the ability to measure information performance will enable the articulation of business benefits and justify information management initiatives (domain 10).

By undertaking these steps appropriately organisations will improve the management of their IAs. The authors caution organisations not to rely on traditional information technology solutions, but to recognise that their IAs comprise a strategic business asset that needs to be managed with the same diligence and rigour as that with which they manage their financial assets. Using the HIAM model to guide improvement of IAM practices, will enable organisations to transform themselves for the digital era, to be more competitive and profitable, improve business performance, mitigate their business risk and enhance the customer/client experience. Roe (2019) summarises it well:

> *If information management is driving digital transformation and digital transformation requires better information management, then before enterprises implement a digital transformation strategy, they need to get their information management strategy in place too. Without it, they face failure.*

7. Future research

The model will be formally validated to produce a formal maturity assessment instrument, a business impact assessment and a roadmap for

improving the IAM practices in organisations.

CRediT authorship contribution statement

Nina Evans: Writing - original draft. **James Price:** Writing - review & editing.

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