A Comprehensive IS-Enabled Framework and IS Research Agenda to Improve Contributions to Environmental Sustainability by Universities

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Abstract

For more than 25 years, universities have been acknowledged as having the potential to make crucial contributions to addressing the challenges of environmental sustainability. During this time, many universities have undertaken activities in support of sustainability, although few have succeeded in realizing their potential to make significant contributions in research and education or as adopters of sustainable practices within their institutions.

This paper aims to assist universities to improve their contributions to the challenges of environmental sustainability by: reviewing current literature guiding universities to support sustainability; identifying gaps in the literature; and, proposing a composite framework to facilitate contributions by IS-enabled innovations that significantly improve the level of sustainability behaviours and practices in universities. An IS research agenda integrated with the Composite Framework is proposed.

Keywords

Sustainability, Universities, IS-enabled Innovation Framework, IS Research Agenda

INTRODUCTION

A quarter century ago the Brundtland Commission identified universities as playing "a crucial part in putting the world onto sustainable development paths, in laying the groundwork for our common future" (UN 1987, p.16). The Commission posited the idea of sustainability in terms of development that would meet "the needs of the present without compromising the ability of future generations to meet their own needs" (UN 1987). With this idea of intergenerational equity as a guiding principle, the Commission appealed for universities to engage their mission of research, learning and teaching in order to inculcate capabilities in communities globally to achieve sustainability at the spatial and temporal scales required to prevent predicted adverse impacts of human behaviour on the world's ecosystems – in particular climate change. In one leading practitioner's appeal to universities to renew efforts towards sustainability (Sharp 2002), the potential to realize this contribution was identified in: the active promotion of sustainability research and scholarship; education to all students in sustainability; outreach activities to communities; and achievement of sustainability at all levels within university institutions. Information Systems (IS) have a key role in assisting universities since technology is   recognized as an essential enabler of solutions to the challenges of achieving sustainability (Stern 2007).

A generation has passed and serious questions remain in the current analysis of the university sector's efforts to contribute to sustainability. A survey of sustainability initiatives in US colleges and universities (NWF 2008) looked at the experience of over 1,000 universities (representing 27% of the sector) and found that while there were many initiatives towards sustainable operations on campuses, only a third had undertaken a strategic, integrated approach to achieving sustainability. Affecting organizational change is difficult and the level of success by universities in implementing strategic

change for sustainability is similar to the findings of a global survey on the efforts of more than 1,500 business, government and not-for-profit executives in leading organizational change for a range of objectives. Thirty to forty percent of organizations were successful or partly successful in achieving their goals (McKinsey 2006). Arguably of greater concern, however, are the NWF (2008) findings that in recent years the level of education on sustainability issues was static or, potentially, in decline. While the finding on the sustainability of organizational operations is of concern, the findings of a potential retreat from educating about sustainability goes to the heart of the Brundtland Commission's call for universities to develop capabilities for sustainability in the community at large.

During the period that university efforts have been modest, bodies such as the Intergovernmental Panel on Climate Change (IPCC 2007), the British Government (Stern 2007), the United States government (NIC 2008), the European Parliament (EU 2003a; 2003b) and the governments of 192 countries ratifying the United Nations Framework Convention on Climate Change (UNFCCC 2007) have accepted scientific evidence that current human behavior is not sustainable. While there is political debate in some countries as to the value of immediate action to mitigate the causes of climate change, nevertheless there is broad agreement internationally that fundamental change is needed in current economic, social and policy-driven practices to achieve environmental sustainability.

Despite these statements of broad strategic intent at government level, the root causes of the limited progress in participation in the drive to sustainability by universities are unclear. The literature has not resolved the meaning of sustainability for universities and how they can best proceed in the mission of changing human behaviour to reduce harmful impacts on the environment. Further research into the effective implementation of sustainability in universities has been called for (Carpenter & Meehan 2002; Wright 2002), along with calls for greater assistance to university administrators seeking more sustainable operations (ACTS 2011) and renewed efforts to overcome resistance to the needed changes in university strategy and mission (Sharp 2002). Of particular relevance to the ACIS 2012 Conference considering "location" of the discipline of Information Systems, is recognition of the key contribution by technology in meeting the challenges of environmental sustainability (Stern 2007). Nevertheless, there is a lack of assistance to universities in their adoption of technology-enabled approaches that led to the joint call for improved tools to implement sustainability initiatives in higher education by the Australasian Campuses Towards Sustainability (ACT) and, in the UK, the Environmental Association for Universities and Colleges (EUAC) (ACTS 2011).

Consistent with the ACIS 2012 theme on locating IS scholarship, and in response to the limited contributions by higher education to sustainability, this paper aims to assist universities to: improve their current levels of contribution to the challenges of environmental sustainability; consider what level of assistance is available in the current literature to guide universities to support sustainability; consider what gaps exist; determine if the literature may be adapted to address the gaps; and identify and facilitate potential contributions by IS-enabled innovations and activities to improving the level of adoption and diffusion of IT-enabled sustainability behaviors and practices in higher education. These aims address the Green IS and Sustainability track focus by investigating current and potential contributions IS can offer in resolving societal, environmental and economic challenges related to meeting the needs of the present without compromising the needs of future generations.

To address these aims, the paper's subsequent structure is: establishment of the relevance of the issue to IS; description of the research approach; discussion of literature that has been purposively selected to show diversity in local, national and international sources on sustainability practices in higher education; proposal of a synthesis of concepts in a strategic framework for IS-enabled development of sustainability strategy for universities; and conclusions and implications for IS researchers in an innovative agenda to focus on IT-enabled sustainability practices in universities.

RELEVANCE TO INFORMATION SYSTEMS

A key contribution of IS is that, "it examines more than just the technological system, or just the social system, or even the two side by side; in addition it investigates the phenomena that emerge when the two interact." (Lee 2001, p.iii). IT is understood to be a key tool in the achievement of sustainability by enabling changed behaviour and practices (Stern 2007). Innovative use of IS can enable the means of moderating and tracking solutions devised to achieve global sustainability (Elliot 2011) so sustainability may be seen as a mainstream issue for IS.

The IS field of study has also been challenged to undertake more research with high impact in order to avoid being marginalized (Agarwal & Lucas 2005). Given its critical contribution to society and also to universities, sustainability is a domain not to be overlooked by the IS research community as it seeks to

make a highly visible contribution in an area of its expertise. To date, theoretical contributions in this domain have been limited (Elliot 2011, Watson et al. 2012) but a recent review of the IS discipline (Lee 2010) called for greater commitment by IS researchers to theory relating to professional practice.

'Theory-in-use' presented as generalizable frameworks and models based on analysis of examples of professional practice (Lee 2010) may serve to assist practitioners realize their goals while also increasing the relevance of IS researchers' empirical and theoretical contributions. Theories-in- use include models for developing and managing IS in information (e.g., representation and adaptation) and systems dimensions (e.g., data, technological and organizational subsystems) (Lee 2010).

RESEARCH APPROACH

This paper's investigation into improving contributions to sustainability by universities through IS research is guided by three research questions. In keeping with the paper's aims, these questions are:

1) What level of assistance is available in the current literature on sustainability in universities?
2) What gaps in this capacity to assist universities to address sustainability can be identified in the literature? and
3) Can the current literature be adapted to address the gaps using IS in research and practice?

The scope of this paper covers all activities by universities aimed at addressing the challenges of environmental sustainability, including: research, learning, teaching, internal operations, administration, external linkages and community outreach.

The authors purposively selected (Miles and Huberman 1994) sources with frameworks, models and experiences applicable to sustainability in universities based on: the relevance of their aims to this work, their actual and potential generalizability, and their extent of usage. These sources were analyzed to address senior decision-maker uncertainty and assist in the implementation of sustainability in universities. Elements of the different models with specific objectives and scope were analyzed to create an integrated composite framework with comprehensive objectives and scope. This approach may be susceptible to the challenge of mixing incompatible elements. In this situation, however, the models had a common domain: contributions by universities and other organizations to address the challenges of environmental sustainability. The models' differing focus within this common domain reflected different aspects of the multi-faceted challenge. Therefore, this paper takes a *prima facie* position that a composite framework of varying elements from different models within a shared domain may have utility to executives seeking to better understand that domain.
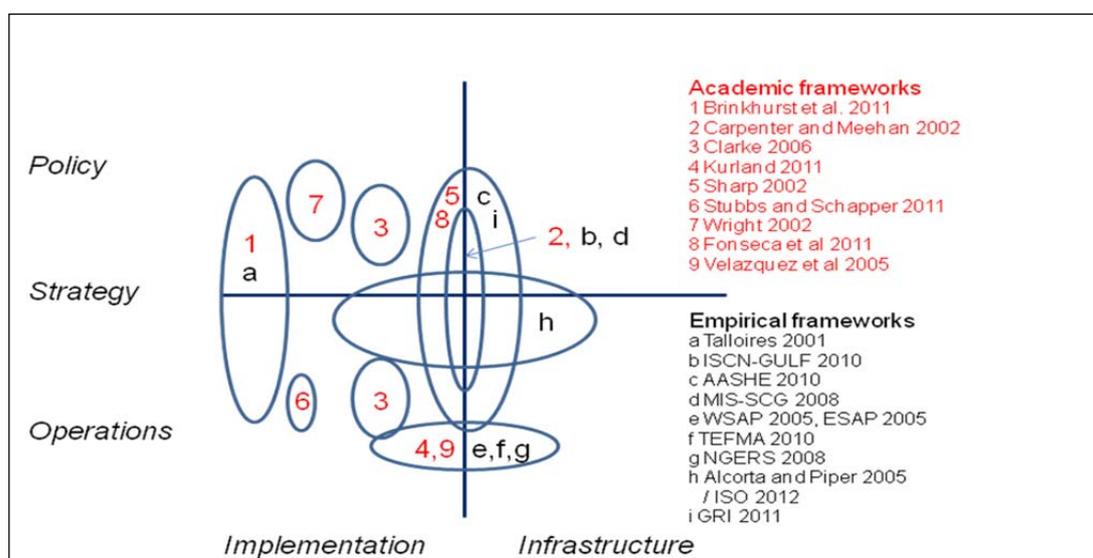

Figure 1: Literature analyzed by focus and scope showing gaps in coverage

SUSTAINABILITY IN UNIVERSITIES: CURRENT LITERATURE

An examination of frameworks, models and planning guidelines for university sustainability purposively selected from the literature presents potential sources of assistance for university

executives seeking to make greater contributions to environmental sustainability. Figure 1 plots this selection of empirical and academic sources by the scope of usage, from high level policy through strategy to operational issues and by focus on implementation or infrastructure development.

Prominent examples of high level, conceptual frameworks for universities are seen in sustainability declarations, including the Talloires Declaration (Talloires 2001). Developed in 1990 with over 430 signatories internationally, this is the oldest statement made by university senior administrators of a commitment to sustainability in higher education (Talloires 2001; 2008). The International Sustainable Campuses Network and Global University Leaders Forum Charter (ISCN-GULF 2010) was developed by 31 leading research-intensive universities. It locates the sustainable development of infrastructure in a set of nested principles that integrates research, teaching, facilities and outreach for sustainability in a context of campus wide planning, development and performance target setting.

An Australian-based development by the Sustainable Campus Group (SCG) is based in the Monash Sustainability Institute (MSI) (MSI-SCG 2008). This group developed a sector-specific reporting framework for its 27 participating institutions, including vocational training and education sectors. A comprehensive framework is the Sustainability Tracking, Assessment and Reporting System (STARS) developed by The Association for the Advancement of Sustainability in Higher Education (AASHE). This is a benchmark framework for more than 66 member universities in North America (AASHE 2010). Participation acts as a means to foster accountability within the group (Fonseca et al. 2011), although not publicly.

Sustainability frameworks from outside the university sector were selected to ensure university executives are informed by organizational responses to sustainability from a broad range of sectors. The International Standard Organization's ISO 14001 suite of standards is used by more than 200,000 organizations internationally (ISO 2012). Arguably, the utility of the ISO system is geared more to industries and business with well defined environmental impacts that fall comfortably within the scope of the standard (Alcorta & Piper 2005). Although the number of universities using ISO 14001 is not reported, its use in universities has been identified (Carpenter & Meehan 2002). The Global Reporting Initiative (GRI 2011), with over 3,000 organizations internationally, is utilized by less than 25 "education" organizations (Fonseca et al. 2011). The GRI framework provides participants with transparency of information on social and environmental issues at the same level as financial information (Brown et al. 2007).

Some frameworks have a narrow focus on operations, such as on energy efficiency, water savings or waste minimization. These frameworks may be based on voluntary membership of a sector alliance (TEFMA 2010) or mandated by government (ESAP 2005; WSAP 2005; NGERS 2008). A narrow operational scope need not equate to a narrow scope of impact. The NGERS (2008) framework for the reporting and mitigation of greenhouse gas emissions links directly to the United Nations Framework Convention on Climate Change (UNFCCC 2007).

All frameworks outlined above serve as sources to assist university executives at some level to guide sustainability. To an extent, they each represent aspects of a comprehensive framework but none covers "all the bases". In particular they do not provide a comprehensive scope regarding policy, strategy or operations in developing infrastructure. Commitment to any one framework potentially represents a major undertaking in terms of the administrative effort, deployment of resources, engagement of stakeholders and reputation. Unfortunately, the frameworks and academic literature offering perspectives on the frameworks (Brinkhurst et al. 2011; Clarke 2006; Kurland 2011; Stubbs & Schapper 2011) and academic literature describing experiences in universities (Carpenter and Meehan 2002; Sharp 2002, 2009; and Wright 2002) all lack the scope, focus and details necessary for comprehensive assistance to universities on how they might address the problem of low levels of commitment to sustainability and the decline in educational programs identified earlier in this paper.

In other words, none of the highly regarded and utilized frameworks and experiences purposively selected for analysis support the strategic intent of university executives to determine and implement an integrated set of actions to achieve beneficial changes in the quality of the environment. Drivers for such change in the literature include: leaders' commitment to sustainability; availability of financial incentives; communication and compliance (Bartlett & Chase 2004; Kurland 2011). Inhibitors to change in the literature include: funding constraints; lack of communication and information among stakeholders; lack of appropriate campus or government policies for support; lack of shared values; and lack of capabilities to implement the initiatives (Kurland 2011; Velazquez at al 2005). These drivers and inhibitors of change to affect environmental sustainability outcomes need to be addressed by frameworks seeking to support universities' contributions to environmental sustainability.

TABLE 1: Composite Framework for Management of IS enabled
Environmental Sustainability (EVS) Initiatives in Universities

Framework Elements	Description and Opportunities for IS research	Sources
1. Strategic Intent		
1a. Institutional Mission (EVS)	Redevelopment of university mission to integrate EVS	Ref: AASHE 2010; ISCN-GULF 2010; Sharp 2009
1b. Institutional vision	Development of institutional vision in support of EVS that is (a) more holistic, or (b) more detailed	Ref: (a) Talloires 2011; ISCN-GULF 2010; (b) AASHE 2010.
1c Institutional policy, strategy and goals	Development of institutional policies, strategies and goals, including IS enabled research, education, operations, that may be (a) holistic or strategic (b) comprehensive, or (c) narrow and detailed (operations level only)	Ref: (a) Talloires 2011; ISCN-GULF 2010 (b) AASHE 2010, Alcorta & Piper 2005. (c) WSAP 2005, ESAP 2005, NGERS 2008
2. Scope		
2a. Institution level (unit of analysis is a single university, or sub-group)	Framework for (a) single university (b) faculty (c) facility/building (d) individual campuses	Ref: (a) AASHE 2010; MSI-SCG 2011; WSAP 2005; ESAP 2005; TEFMA 2010 (b - d) ISO 2012; GRI 2011
2b. Inter-university and inter-organizational linkages	IS-enabled links to (a) leading research universities (b) regional organizations, (c) other organizations for benchmarking and outreach purposes. Nature and effectiveness of IS-enabled linkages?	Ref: (a) ISCN-GULF 2010, (b) MSI-SCG 2011; AASHE 2010; TEFMA 2010 (c) ISO 2012; Alcorta and Piper 2005; GRI 2011; WSAP 2005; ESAP 2005
2c. Time frame (reporting cycle)	All frameworks have annual reporting (IS enabled).	ISO 2012; GRI 2012
2d. Focus themes	(a) Comprehensive reporting for whole of university, or (b) specific focus on a narrow area, such as by function (e.g., education) or location (e.g., a campus) Role of IS?	Ref: (a) AASHE 2010; (b) Stubbs and Schapper 2011
2e. Level of operational focus	Either: (a) integrated across all operational areas; or (b) specific operations (e.g., water, gas, etc). Role of IS as a critical facilitator of operational initiatives?	Ref: (a) TEFMA 2010; ISO 2012; GRI 2012 (b) WSAP 2005, ESAP 2005, NGERS 2008
2f. Awareness/literacy	Focus on: (a) equity, access, teaching, learning, research; or (b) staff engagement in operational initiatives. Role of IS & IS enablement.	Ref: (a) AASHE 2010; MSI-SCG 2011 (b) GRI 2011; WSAP 2005, ESAP 2005:
2g. Culture of EVS in institution	Harvard case focuses on importance of culture; or (b) measures of culture	Ref: (a) Sharp 2002: (b) AASHE 2010; MSI-SCG 2011.
3. Stakeholders		
3a. Driving stakeholders	Consensus: driven from highest levels but includes internal & external stakeholders; high level committee with oversight and inclusive, transparent processes. (b) Harvard Model: executive drivers with increasing levels of peer-to-peer engagement. Role of IS in enabling drivers.	Ref: (a) sector examples: AASHE 2010; MSI-SCG 2011; trans-sector example: GRI 2011 (b) Sharp 2002

3b. Participants	Consensus: high-level Steering Committee oversees strategy, implementation & reporting. Stakeholder access to decision making & performance review. Role of IS?	Ref: AASHE 2010; MSI-SCG 2011; WSAP 2005, ESAP 2005
3c. Peer-to-peer learning (students/staff)	Harvard Model: central benefit of peer-to-peer engagement as a tool for corporate change and capability building. Role of IS in learning?	Ref: Sharp 2002
4. Implementation*		
4a. Staff resources	Harvard Model is well staffed. Other frameworks acknowledge staffing levels crucial to development of capabilities *	Ref: Sharp 2002
4b. Communications	Necessity for well developed communications and engagement strategies *	Ref: AASHE 2010; MSI-SCG 2011
4c. Budgets/funding models	(a) Harvard has "funding engine" to drive program expansion (b) funding required to drive continuous improvement *	Ref: (a) Sharp 2002 (b) WSAP 2005, ESAP 2005.
4d. Interdisciplinarity (educational & operational)	Benefit of equity and access comes closest to addressing interdisciplinarity *	Ref: AASHE 2010.
4e. Evaluation	Select metrics: (a) sector specific; (b) narrow focus; (c) broad focus *	Ref: (a) AASHE 2010; (b) WSAP 2005, ESAP 2005; NGERS 2008 (c) Alcorta & Piper 2005.
4f. Reporting (internal & external for benchmarking and compliance)	Consensus: annual reporting to external bodies for benchmarking and compliance. More frequent, detailed internal reporting. WSAP-ESAP: 4 year cycle of review *	Ref: WSAP 2005, ESAP 2005.
4g. Outreach (sector, community)	Mission/outreach (a) to community is central; (b) for operations and infrastructure advice *	Ref: (a) Talloires 2001, 2008; (b) ISCN-GULF 2010
4h. Sustaining commitment levels	Renewal: (a) is a key part of engagement; (b) principles for increasing strategic focus, evaluation & renewal *	Ref: (a) Sharp 2002; (b) Alcorta & Piper 2005.

*The role of IS as a critical facilitator of implementation activities requires investigation, analysis, evaluation and reporting

A COMPOSITE FRAMEWORK

A Composite Framework is proposed that brings the selected frameworks into an IS structure providing an overarching holistic approach. This addresses how frameworks can work together according to the scope and relevance of the respective models. It serves to assist decision makers in universities implement sustainability commitments at multiple organizational levels, and to engage multiple stakeholder capabilities in top-down, bottom-up and middle-out strategies (Brinkhurst et al. 2011; Sharp 2009) that comprehensively harness drivers and overcome inhibitors of sustainability. This represents a theoretical model of supportive infrastructure that incorporates data, organizational and technological systems (Lee 2010) based on available frameworks and experiences that enable and guide stakeholders at all levels in changing behaviors to improve the quality of the environment.

The Composite Framework is presented in Table 1. The elements in the first column represent a holistic sustainability agenda for university executives, with the references in the third column showing sources for each element. The center column provides a context for how the agenda and sources may inform action. This systemic approach to sustainability links the development of infrastructure with the development of information technology in a way that increases shared understanding, integrates activities and leads to fundamentally changed human behavior mediated by these capabilities that can result in measurable improvements in the quality of the environment. The Composite Framework aims

to assist in determining the scope, direction and implementation of sustainability strategy. The Composite Framework's sources are not presented as the only options but as examples in a systemic approach that guides and informs ongoing choices. These options need to be informed by expertise and other stakeholder needs, subject to ongoing refinement based on the experiences of implementation. A continuous evaluative process drives the strategic intent to improve the quality of the environment. The contribution offered by integrating IS in this way to develop university capability for achieving sustainability is that it addresses the following drivers, inhibitors and gaps in current offerings:

(a) leadership commitment to sustainable practices applying IS to support action, evaluation, and decision-making capacity in initiatives leading to fundamentally changed human behavior impacting positively on the quality of the environment (Bartlett and Chase 2004; Kurland 2011);

(b) strategic intent, appropriate resourcing and staged development leading to focused and sustained efforts missing from earlier frameworks (Wright 2002);

(c) integration of data collection and reporting, bringing together databases and data systems to ensure alignment of metrics, targets, indicators and values, improving access to data and reports, including improved security and reliability of data (Kurland 2011);

(d) engagement of stakeholders, ensuring early agreement on values and vision, enabling top-down and bottom-up stakeholder engagement and middle-out peer-to-peer engagement (Brinkhurst et al. 2011), developing internal alliances through peer-to-peer learning that underpins effectiveness of change management and external alliances (Kurland 2011; Velaquez et al. 2005); and

(e) commitment to implementation, resourcing and engaging organizational capacity (Kurland 2011).

A worked example describing application of the Composite Framework to address major inhibitors to environmental sustainability is now presented. Due to demand from industry, professional bodies and students, as well as call from the national government for increased commitment from the university sector to prepare business, government and society to meet the challenges of achieving environmental sustainability, the new President of University X charged the Provost with personal responsibility for immediate action. The Provost, with no prior experience in this area, is uncertain about how to proceed.

After consulting the Composite Framework (Table 1) the Provost established a task force to identify, plan for, develop, implement, monitor, evaluate and report on a set of integrated courses and programs to address requirements for professional-level education in aspects of sustainability. The first step was to establish strategic intent. This initiative was aligned with the University's mission and vision, which were revised to explicitly acknowledge sustainability as a core commitment. Draft policies and strategies for educational innovations with identified targets, timelines and indicative budgets for each of the eight faculties were prepared by the Task Force and presented to the University's Council, which approved the proposal and an initial tranche of funding. To ensure university-wide focus on this initiative, Council also set tight time frames.

The Task Force considered the scope to be at university level, with benchmarking to other universities. Public reporting would be annually, with progress timelines reviewed on a weekly, monthly and quarterly basis. Initially, the focus theme would be education but from the second year, building and facility operations would need to demonstrate continuous progress towards energy reduction targets to be set by the Council. Development of a culture of sustainability was seen to be necessary and an awareness / literacy program was to be prepared, commencing with academic staff in support of the educational initiatives.

The third section in the Composite Framework, stakeholders, participants and peer-to-peer learning, were considered and appropriately addressed. The fourth section, implementation of policies and strategies, has been noted as a particular source of uncertainty. The Composite Framework identifies eight elements, including staff resources, communications, budgets, inter-disciplinarity, reporting, outreach and sustaining the initiative. Each element represents an agenda item to be considered and resolved for implementation of the university-wide strategy. This example addresses uncertainty by demonstrating how the Composite Framework could be applied to assist a university implement a sustainability initiative. The details are not prescriptive but are presented as integrated agenda items for executives to consider for relevance to the university's context and objectives.

Based on the Composite Framework, an innovative IS-research agenda is proposed. This agenda is innovative as it: 1. facilitates efforts in an under-researched topic for IS, environmental sustainability, where there has been insufficient direction to aid IS researchers; and, 2. assists IS researchers to aid universities struggling to realize their potential to make significant contributions to addressing the challenges of environmental sustainability by identifying opportunities for IS applications.

Uncertainty about how to proceed has inhibited universities from making more significant

contributions and this uncertainty is addressed directly by proposal of a Composite Framework for integrated actions in determination and execution of strategic intent, scope and implementation for a range of stakeholders. Innovative IS research efforts can assist to make contributions in this field by focusing on enabling the specific elements in the Composite Framework through applications of technology. This addresses the need to make rigorous contributions to their university employers and their communities as well as to assist their students. Application of the Composite Framework as proposed can assist in addressing the challenges to IS researchers as it focuses attention on IS applications for strategy development, ensuring relevance of scope, facilitation of stakeholder engagement, monitoring, evaluating and reporting progress, and, as and where required, moderating the impact of a dynamically deteriorating environment on universities and their societies. In these ways, the IS discipline could contribute to supporting drivers of change, overcoming resistance to change, and addressing the diverse challenges of environmental sustainability.

CONCLUSION AND IMPLICATIONS

Universities are recognized as being essential contributors in addressing the challenges of environmental sustainability (UN 1987) but despite many initiatives, as a whole, universities have not succeeded in realizing this potential. In particular, uncertainty prevails as to the meaning of sustainability for universities and how they can best proceed in the mission of changing human behaviour to reduce harmful impacts on the environment.

This situation is addressed by this paper's aim and its research questions. The aim is to facilitate the development of behaviors and practices in the university sector that make a significant contribution towards achieving environmental sustainability. The first research question is: What level of assistance is available in the current literature on the sustainability of universities? Literature purposively selected for its relevance to the paper's aim included sector-specific empirical sources that range from conceptual, high level models for guiding sustainability, to more comprehensive frameworks, and frameworks that focus on narrow operational issues. The second research question was: What gaps in this capacity to assist universities achieve sustainability can be identified in the literature? Individually, none of the widely utilized frameworks purposively selected for relevance to the paper's aim was found to adequately support strategic initiatives by university executives to improve the quality of the environment, see Figure 1. The third research question, can the current literature be adapted to address the gaps using IS in research and practice, was addressed by the Composite Framework (Table 1). This brings all the models covered in the literature review into an IS structure that provides an overarching holistic approach. This can guide implementation of sustainability commitments at multiple organizational levels, and to engage multiple stakeholder capability to comprehensively harness drivers and overcome inhibitors of sustainability in universities.

The applicability of the Composite Framework may be limited by the literature selected and by the reduced opportunities for testing in a 10 page article. However, this initial effort to address a persistent problem suggests that the Composite Framework has utility in addressing gaps in current models of sustainability application in institutions of higher education, although this contention will need to be tested through further research. Implications for university executives are that a holistic technology-enabled approach is essential and is feasible.

The IS discipline has its own challenges as well as those relating to sustainability. Challenges to the IS discipline include calls to increase the relevance of its research and learning and to address global issues (Agarwal & Lucas 2005). The environmental sustainability of ICT presents a logical area for IS research focus since it falls clearly within the core of the discipline (Lee 2001). Many sustainability initiatives require application of IT for their success (Stern 2007) but universities require assistance in addressing the challenges in transforming current behaviors into more sustainable practices.

The implication for IS researchers is the necessity to make rigorous contributions to their university employers and their communities as well as to assist their students. Application of the Composite Framework can assist in addressing the challenge to IS researchers to improve the relevancy of their work since it focuses attention on IS enablement of strategy development. In this way, the IS discipline has the potential to contribute to supporting drivers of change, overcoming resistance to change, and addressing the diverse challenges of environmental sustainability, for the benefit of all concerned.

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