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Author(s): Azmat Ullah, Richard Lai and Timothy Marjoribanks
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Abstract:

In the context of climate change and the struggle for environmental sustainability, the concept of "Green Computing", also referred to as "Green IT", has assumed increasing importance, both within organisations and among information technology and information systems researchers. Green computing refers to the practice of using computer resources in an environmentally sustainable manner, thereby promoting corporate social responsibility by using such resources more sustainably and professionally while maintaining or increasing the overall performance of computer services which are being used in business organizations. To date, research in the area of green computing and organizational sustainability has primarily focused on the practices of information technology vendors and on the beliefs and behaviours of technology users around green computing. In this paper, we present a theoretical framework for analyzing and understanding green computing in the context of building a sustainable business environment. Six organizational processes, namely, business strategy, business structure, business culture, technology strategy, technology structure and technology culture are proposed as critical to an analysis of green computing.

Index Terms--Green computing; Business sustainability; Business Strategy; Business Structure; Business Culture; Corporate Social Responsibility; Technology Strategy; Technology Structure and Technology Culture

Full Text:

I. Introduction

Globalization, technological innovation and the virtualization of the business organizational environment have been significant developments over at least the last twenty years in economies around the world. Combined, these processes have contributed to profound organisational transformations, with organisations needing to reconstruct their internal structures and their value chain, while also creating and recreating strong relationships with both existing and new customers and business partners, both domestically and internationally. In this context, the adoption of new forms of information and communication technologies has had a significant effect on many organisations across all sectors of society (Castells 1996, second edition, 2000).

To succeed in this innovative and competitive context, organizations are increasingly focused on the need to adopt efficient and effective technological services at all levels of their business to increase operational efficiency and business performance and, in many instances, to seek to ensure their ongoing survival in a globally competitive environment (Ward and Griffiths 1996; Feeny and Ives 1990; Swierczek and Shrestha 2003; Ullah and Lai 2010a).

This dependence on information technology also creates tensions for organisations, as this increasing

demand for technology requires significant energy use which contributes to global warming and climate change (John and Laitner, 2003). Global warming and climate change are widely recognized as providing fundamental challenges for organisations, and indeed for societies, around the world, including ultimately the capacity for long term survival. For business organisations, therefore, this suggests an urgent need to redefine understandings of efficiency and effectiveness, so that social and environmental concerns become at least as important as economic concerns, in particular profit maximization, when decisions are made relating to the adoption of information technology and computing resources and their mobilization within organisations.

Climate change and global warming are significant threats to this planet and to human society. Human activities have been primarily responsible for global warming since the middle of the twentieth century. As the CSIRO has reported, 'It is very likely (at least 90 per cent likelihood) that most of the observed global warming since the mid-20th century is due to increases in greenhouse gases from human activities. Human activities also have influenced ocean warming, sea-level rise, and temperature extremes' (CSIRO, 2012; see also EPA, 2012; Stanford 2009). Many human-based activities contribute to climate change and global warming, including but not limited to the burning of fossil fuels; land use change and deforestation, including burning and eliminating vegetation; agricultural use of land; and a range of industrial processes, such as natural gas production, cement manufacture and coal mining (Barnett, et al, 2005; NASA, 2013, Yoshida, 2010).

The increasing demand for information technology from business organizations also contributes to global warming and climate change because computer equipment uses significant levels of electricity, still commonly produced through the burning of fossil fuels, while critical environmental sustainability issues also arise at an organizational level concerning the processes through which computer purchases, usage and disposal decisions are made. As Donnellan et al. indicate, 'researchers estimate that information and communication technology (ICT) is responsible for at least 2 percent of global greenhouse gas (GHG) emissions. Furthermore, in any individual business, ICT is responsible for a much higher percentage of that business's GHG footprint' (Donnellan et al., 2011, 33). At the same time, these authors make the important point that 'researchers also estimate that ICT can provide business solutions to reduce its GHG footprint fivefold' (Donellan et al., 2011, 33). In other words, while current uses of ICT in organisations create significant challenges in the context of climate change, there is also the possibility for organisational behaviour to transform current uses of ICT, in ways that can respond to sustainability challenges (Laitner, 2002).

This paper aims to develop and present a theoretical framework for analyzing and understanding green computing in the context of building a sustainable business environment. Overall, we argue in this paper that, in the context of climate change, there is an urgent need for organizations to consider the green computing option as one practical response to the threat of global warming and climate change. Our future plan in this work is to empirically test this framework and answer the following questions:

Hypothesis 1: Do interactions between business and technology strategies influence the processes of developing a sustainable business environment?

Hypothesis 2: Do interactions between business and technology structures influence the processes of developing a sustainable business environment?

Hypothesis 3: Do interactions between business and technology cultures influence the processes of

developing a sustainable business environment?

In short, in this paper, we present a framework that provides a foundation for engaging with these questions. In future work, we will collect and analyse data that will engage with these questions, thereby enabling the further development and refinement of the proposed model.

II. THE CONTEXT OF OUR WORK

While green computing covers many areas of computer use in organisational contexts, one crucial dimension is managing energy use (Laitner, 2003). This paper presents an approach to managing energy utilization within the business organization in the context of business and technology interaction and green computing. As a foundation for the theoretical content of the paper, it is important to establish the theoretical concept of both business and technology interaction, and green computing, prior to proposing a framework for green computing.

A. Business and Technology Interaction

Before the development of the concept of the interaction between business and technology, the terms information technology and information systems referred to the employment of hardware and software applications to manage client data; while computer software applications and hardware developers and testers performed the function of scientific and mathematical calculations. Over time, technology practices evolved in the fields of business and company data supervision, including data recovery, data manipulation and analysis, and the development of computer software applications and analysis of business data (Ullah and Lai 2013b). A field of study was needed to begin to make the connection among computer developers and the business world so that information-based applications could be implemented for businesses and networks. In other words, there was a need to challenge the boundaries between business and technology.

Critical analysis of business and technology interaction in the context of information systems has increased over time as information technology began to impact each level of the business, including the business planning level, business strategy level, business structure level, business social and culture level, and project level (Luftman et al., 1993; McKeen and Smith 2003, Mintzberg et al. 2003). Such research has shown that organisations which were based on conventional business strategies have often been unsuccessful in embracing the full benefits of technology. They used technology only to support the back office or considered it an expense rather than a business assessment enabler (Henderson and Venkatraman 1993; Alter 1995; Brynjolfsson 1993). To overcome these issues, the idea of interaction was discussed with different terminology being used, including synchronization, linkage, harmony, interaction, integration and bridge (Reich and Benbasat 1996; Teo and King 1996; Gartlan and Shanks 2007).

The concept of interaction between business and technology involves optimizing communication between business executives, who formulate the organizational decisions, and technology managers, who supervise the technical operations. The development of flexible business plans and information technology architecture, as well as efficient cost allotment, are serious components of any business and technology interaction effort. Technical department managers can recommend proposals that can be customized to seek to promote an optimum return on company investment. Business executives can attend technology department meetings and seminars to increase their understanding of the technical

abilities and limitations of the organization. Taking this further, the organizational layout and structure of companies can be transformed so that business and technology managers interact on a daily basis, thereby promoting cross-fertilisation of ideas and practices. In short, steps can be taken to break down existing organizational silos.

The process of interaction between business and technology has been defined in various ways. For example, Broadbent and Weill argue that interaction between business and technology depends on the degree to which it is allowed, supported and motivated by information technology strategies (Broadbent and Weill 1993). Luftman et al. define it as the extent to which technology and business liaise when formulating their mission statements, their objectives and their strategic plans and whether these are supported by the information technology strategy (Luftman et al. 1999). According to Luftman and Brier, interaction focuses on different business organizational activities, that is, the activities which need to be performed to achieve the goals of the organization (Luftman and Brier 1999).

Theories of business and technology interaction have expanded over time and researchers have identified many challenges to such interaction, such as the structural complexity of the organization, a lack of business executive level involvement in technology strategy formulation, a communication gap between business and technology staff, a lack of a formal business and technology strategy, a lack of skills, less technology belief within the business organization, and a lack of connection between business and technology planning (Ullah and Lai 2013b). Moreover, researchers have also explored several business and technology interaction phases, each phase representing a specific part of the business, for example, the internal or external phase, the department phase and the project phase. In the external phase, the business organization interacts with the business partner or with other similar business organizations including clients, dealers and competitors.

In the internal phase of alignment, business interacts with the other departments in the organization. This kind of interaction could be organization phase interaction, department phase interaction, upper and lower phase interaction, project phase interaction, or system phase interaction. What is critical is that these forms of interaction represent specific organizational attempts to align business and technology, with resulting potential for the introduction of green computing initiatives (Ullah and Lai 2010, Ullah and Lai 2013a).

In addition to the measurement of interaction between business and technology, researchers have also studied several different aspects (also known as sub-types or patterns) of interaction of business organizations separately, including the organization's structure, culture and strategy (Broadbent and Weill 1993, Luftman et al. 1999, King and Teo 1996, Kearns and Lederer 2000, Chan 2002, 1997; Croteau et al 2001). In relation to the measurement of the organization's structure, researchers have focused on the "complex structures", and "rapid changes in structure". In relation to the measurement of the organization's culture, researchers examined "lack of communication", "weak relationships" and "lack of IT belief within the organization". In relation to the measurement of the organization's strategy, they have also considered factors such as "formal business" and "formal IT strategy" in terms of alignment (Ullah and Lai 2010, Ullah and Lai 2013b). However, in order to be able to more fully measure business and technology interaction and to measure the effect of interaction on business performance as well as sustainability, it is important to study the relationship between each type of interaction, as both business and technology have different strategies, structures and cultures. Before proceeding further with this, however, we turn to the question of green computing.

B. The Concept of Green Computing

It is widely accepted that global warming and climate change are a significant hazard to our planet, and that they are the outcome of human action. In the context of organizational sustainability and corporate social responsibility, green computing becomes a crucial organisational objective. As Murugesan argues, 'Green information technology refers to environmentally sound technology. It is the study and practice of designing, manufacturing, using, and disposing of computers, servers, and associated subsystems--such as monitors, printers, storage devices, and networking and communications systems--efficiently and effectively with minimal or no impact on the environment. Green information technology also strives to achieve economic viability and improved system performance and use, while abiding by our social and ethical responsibilities' (Murugesan, 2008, 29-30).

A central purpose of such a program around green computing is to increase organizational success, but in a context in which success is redefined so as to include not only economic success, but social and environmental success. In this regard, the goals of green computing are crucial for the business organization in many aspects, including decreasing the use of hazardous resources, maximizing environmentally aware power efficiency during the product's lifetime, and supporting the recycling of out-dated products and company waste. Modern information technology systems rely on a complex organisational mix of people, hardware and networks. As such, a green computing program must be systemic in nature, reaching through the entire organisation while also being connected to reconceptualisations of organisational objectives and strategies. Indeed, to be truly successful, such strategies must reach beyond the boundaries of any one organisation and be adopted across industry (Ryder, 2008, Rivoire et al., 2007, Stanford, 2009, Widmer et al. 2005).

Researchers have categorized the impact of technology products on the environment into three types. These include first order impacts, which are composed of the direct effects of information technology products on the environment. These effects range from the stage of manufacturing through to the stage of utilization. Second order effects are indirect, and in this order, information technology is seen to provide a large potential to minimize the employment of power and materials within the organization, thereby reducing organizational waste. These effects are developed from the first order effects. Third order effects come as a result of the continual requirement for information technology in the organizational structure. To give one or example, technology and the Internet are deeply affecting the structure of economies, both in changing the relative size and significance of industrial sectors and sub-sectors, and also in changing the size and demography of companies (Houghton, 2003).

III. A THEORETICAL FRAMEWORK FOR GREEN COMPUTING

Green computing is a dynamic research area which has grown rapidly in recent years due to extra uses of energy from technology tools and their application, and a lack of methodologies to analyze the energy that technology tools consume (Gu et al, 2010). Most high performance computer software applications and devices are energy hungry, so there is a need for energy saving components and techniques (Palit et al, 2011).

Green computing requires significant interaction between business and technology. The process of interaction between business and technology is where two different departments in the organization, business and technology, are interconnected with each other and where information technology aims to provide technological services at all levels of the business organization in order that the business goals

and objectives of the organization are achieved in the context of developing a suitable business environment. Moreover, the process of interaction between business and technology is not a single entity which is fixed at a single moment through one action. It involves several ongoing and complex organizational challenges which include: unclear business strategies, skill differences between business and technology staff, a lack of technology awareness among business staff, a lack of business awareness among information technology staff, a lack of awareness of the need for green computing, a lack of technology belief, cultural and social differences between business and information technology staff, structural differences between business and information technology departments and a lack of shared domain knowledge.

Business and technology interaction can be undertaken in several phases, each phase representing a specific part of the business organization, for instance, the internal or external phase, project phase or department phase. Henderson and Venkatraman (1992) consider both internal and external interaction between business and technology in their study and argue that both the internal and external phase are important in order to achieve successful interaction. In the external phase of this process, they suggest that the organization must interact with other related business organizations, and continue to update their information technology department with advanced technologies, while in the internal phase, the business organization must interact with its related departments within the organisation.

The proposed framework established in this paper will use a gestalt perspective fit and theory of co-association in order to identify the interaction between business strategy, business structure, business culture and technology strategy, technology structure, technology culture, as shown in Table 1 (below). Moreover, patterns of interaction depend on the constructs that have been employed to evaluate each pattern. For instance, each of the three interaction types can take two values: positive covariance, and negative covariance. Covariance is a method of computing how strongly two variables associated allience with each other. If the covariance between selected factors patterns is zero, then the factors are not similar to each other; when the covariance is positive, the factors vary directly and are associated relicensed strongly to each other, but if the covariance is negative, the factors vary inversely and are not associated relicensed with one another. Given the nature of the constructs for this proposed study, summarized in Table 1 (below), if each type of interaction indicates positive covariance, this means the organization has a high value of interaction between business and technology departments and this interaction influences the organization in developing a suitable business environment. overall, business and technology interaction is considered neutral if any of the interaction types receives a "positive covariance" value and is considered worse if two or all interaction types receive a "negative covariance" value (Habib, 1991).

The framework is categorized into three phases: phase 1 details the theoretical background and gives an overview of business/technology interaction and green computing; and phase 2 depicts our research framework. The framework presents three different types of interaction fit between business and technology: first, interaction between business strategy and technology strategy; second, interaction between business structure and technology structure; and third, interaction between business culture and technology culture. Phase 1 was described in the previous section of this paper. In phase 2, we discuss the idea of the gestalt perspective of fit and the theory of co-association. In phase 3, we undertake a literature review on the business and technology sectors and extract the factors that contribute to achieving strong business and technology interaction and a better business environment, thereby providing a means for considering the adoption of green computing.

Overall, the proposed framework for analyzing green computing and its adoption in organizational contexts suggests a need to explore three sets of relationships, as set out in Table 1.

First, analysis of green computing requires consideration of the relationship and interaction between business and technology in the organization; second, analysis of green computing requires consideration of the relationship and interaction between organizational structure, organizational strategy and organizational culture; third, analysis of green computing requires consideration of the relationship and interaction between business and technology across each of the dimensions of structure, strategy and culture.

[FIGURE 1 OMITTED]

We propose that the analysis of the interactions and relationships across each of these dimensions adds new dimensions to the existing literature, which provides important insights into these areas but not in the integrated way suggested by the proposed model in this paper.

A. Gestalt Perspective of Fit and Theory of Co-Association

The gestalt perspective of fit and the theory of co-association have been used to examine the association between business strategy, business structure, business culture and technology strategy, technology structure, technology culture. Gestalt is a German word meaning form or shape. The gestalt of fit focuses on the "classification of gestalts which is described in terms of internal consistency between a set of theoretical company attributes," and is inherently "multivariate" in nature. In other word's a gestalt fit demonstrates a reasonable set of consistent or equally possible configurations among attributes (Elder et al. 2002). This gestalt of fit could be useful in order to identify the interactions between organizational factors that contribute towards green computing.

In this paper, the principal objective of organizational possibility studies is used to identify matching patterns of business strategy, business structure, business culture and technology strategy, technology structure and technology culture. This is done by pairing business and technology strategies, business and technology structures and business and technology culture dimensions,, as shown in Table 2. For example, previous research has found that a growing level of company product variety influences multinational companies to prefer a product partition instead of a functional partition structure (Habib, 1991).

Several other organizational studies have tried to relate the information which is used to process company requirements and abilities to business and technology strategies and structural choices (Egelhoff, 1982).

Table 1 shows that, an increasing level of product diversity leads multinational companies to choose a product division rather than a functional division structure. On the other hand, the more extensive information-processing capacity connected with greater organizational structural integration supports diversification in that it supplies business managers with more time and objectivity to perceive business opportunities, for example, through understanding internal company issues and through scanning the external business environment (Rumelt, 1974). Table 1 provides further information on these examples.

Technology researchers translated the business strategy into a technology strategy, conceptualizing this idea in a variety of ways. For example, information technology strategy can be divided into four

dimensions, namely the role of technology in business success, technology systems design and development, competencies and technology infrastructures (Das et al. 1991). In this context, the strategic orientation of information technology systems focuses on the company's function that describes the main goal of the company (Chan, 1997).

The business organization's information processing ability is replicated in its information technology structure. The idea of organizational structure co-alignment has been conceptualized typically in three directions: firstly, the information technology organization's architecture dimension, which comprises the locus of responsibility of the technology function and the degree of decentralization of the technology organizational structure (Brown and Magill, 1994); secondly, the technological architecture direction, which includes the degree of systems application and company data integration, information technology standardization, and the nature of information system hardware used (EinDor and Segev 1982, Fiedler et al., 1996, Holsapple and Luo, 1996, Kaplan et al, 2008); and thirdly, company process and people skills directions, which includes organizational planning mechanisms and the standardization of computer software application implementation and design techniques (Allen, 1991).

The organization's information processing capability is reflected in the business and technology culture. Researchers have studied the business and technology culture by considering the following factors: strong involvement of senior management, well-managed working relationships, strong leadership, belief and effective communication between both groups, business planning at a lower level, communication gaps and cultural relationships at all phases of the business organization (Luftman et al. 1999, Pyburn 1983, Kantrow 1980, Yolande and Chan 2002, Hunt, 1993).

Information technology and information systems researchers have studied two types of bivariate fit relationships, namely business and technology strategies, and business and technology structures (Baets, 1996, King and Sethi, 1996, king and teo, 1999). However, no study has been found which identifies the bivariate fit relationships between business and technology strategies, business and technology structures, and business and technology cultures in the context of green computing. Others have adopted a contingency viewpoint to explain and study the relationship between business and technology strategies and between business and technology structures. It is propose that complete integration between business and information technology departments is important in order to tackle green computing issues.

The proposed modelrefers to the co-association between the following organizational components: business strategy, business structure, business culture, technology strategy, technology structure, technology culture, business-technology association, business performance and energy consumption, where each variable operates on this research instrument, as detailed in the following sections.

A. Organizational Strategy and Green Computing

Organizations are greatly dependent on technological services to progress their business capability in almost all stages of the organization and, to do this, they use significant budgetary resources on technology infrastructure and services. Organizations are constantly facing rapid changes in the business environment, includingin relation to changes in customer services, technologies and product development process. Rapid modernization and strong market competition has forced business organizations to modify their strategies. For example, in the 1960s, the predominant organizational strategy was to produce quantity of product, in the 1970s to produce low cost products, in the 1980s to

produce quality products, in the 1990s to produce products in less time, and in the 21st century, the strategy has changed towards offering more services (Ullah and Lai 2010; Ullah and Lai 2013b).

A business strategy is the means by which a business plans to reach its goals and objectives (Ullah and Lai 2013b). In general, a business strategy covers a time frame of about three to four years, but sometimes it can be longer. It can be described as a long-term business plan and is usually concerned with addressing major resource problems, for example, growing revenue to build a new plant or factory. In other words, the term business strategy refers to the direction and scope of an organisation by which the organisation seeks to attain an advantage through the allocation of its resources in a rapidly changing business environment in order to meet the needs of both the market and the stakeholders (Ullah and Lai 2013). In the context of green computing, the understanding of stakeholders is broadended beyond shareholders to include members of the broader society, as the environmental impacts of business activity are understood to have far reaching effects. Similarly, the goals of the organization are broadened to include environmental and social, as well as financial, objectives.

The idea of business strategy varies within business organization stages. For example, corporate strategy refers to the overall function and goals of the business in order to meet stakeholder prospects; unit strategy refers to how an organization competes in an exacting business environment; and operational strategy refers to how every component or unit of the organization is structured in order to achieve the organizational goals and objectives (Ullah and Lai, 2013b).

In the context of green computing, many researchers have studied business strategy in the area of green computing and argue that organizations are seeking strategies to recycle computer waste and save energy on computer software applications and hardware (Curry et al., 2012, Chow and Chen 2009). In this paper, business strategies have been divided into seven factors and technology strategies into four factors which help to measure product quality, product efficiency and staff effort and time, as shown in Table 2. This further division of organizational factors would help in developing questionnaire in the next face of this research.

B. Organizational Structure and Green Computing

An organizational structure is a system employed to define a hierarchy within an enterprise. It identifies every role in the organization, its function and to where the role reports inside the business organization. The purpose of a structure is to define how a business organization operates and helps an organization in achieving its goals and objectives which potentially allows for the continued existence and future development of the organisation.

In relation to organizational sustainability and green computing, developing the most appropriate structure for the business is important and requires significant effort, because not all types of organizational structure are suited to all businesses or situations (Feeny and Ives 1990).

In relation to business and technology interaction, and organizational structure, several models and techniques have been developed, in a context in which scholars have addressed three major problems related to organizational structure. These include: 1) rapid changes in business structure--businesses often require changes within the organization in order to expand business boundaries and boost performance. Business structure is one of the first things that needs to be changed when a business grows; 2) a business structure is complex - information technology is more flexible in a smaller

organizational business structure; 3) a lack of information technology support the business structure needs to be decentralized to align with the organization's units and the organization's projects (Ein-Dor and Segev. 1982, Fiedler et al., 1996, Holsapple and Luo, 1996).

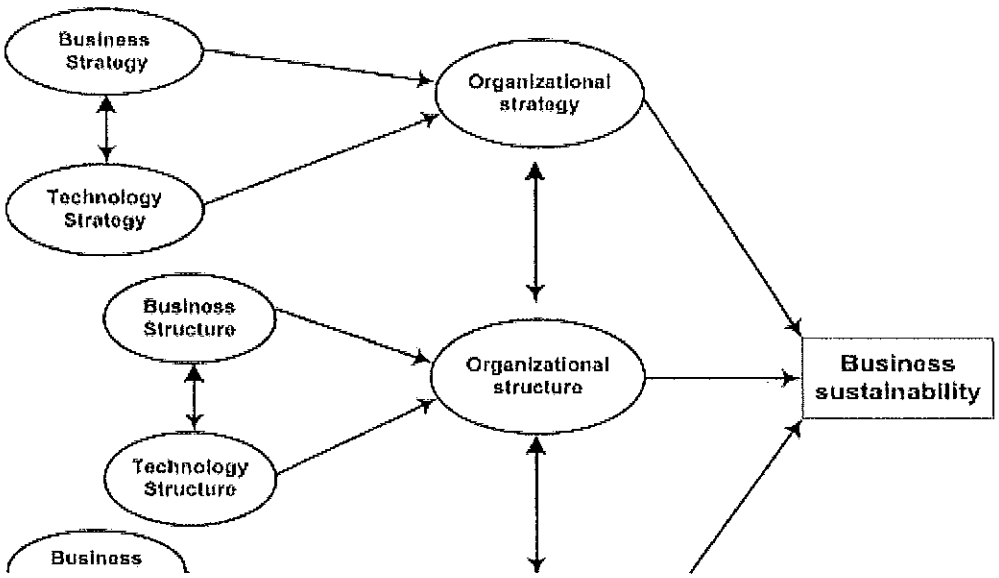
In this paper, business structure has been divided into five factors and technology structure divided into four factors, as shown in Table 2 (Hall 1992; Pugh et al. 1969; Damanpour 1991; Miller et al. 1991; Paulson and Stump 1979; Harmon, et al, 2009, Hasbrouck et al, 2008). These factors have been identified from the literature as a means to measure the organizational structural complexity and capability in the context of organizational sustainability and green computing.

C. Organizational Culture and Green Computing

The literature shows that a strong business organizational culture is required in order to build an appropriate working relationship between the business and technology functions and achieve successful interaction between business and technology (Kantrow, 1980). Strong cultural relationships between senior management may achieve strong alignment between business and information technology in the context of building a sustainable business environment (Luftman et al., 1999). However, the business/technology research literature also shows that business organizations are frequently becoming more advanced and complex than in the past, which could affect the cultural relationship between business and technology staff in an organization which might have an adverse impact on the environment due to the lack of a cultural, strategic and structural relationships between business and technology staff.

The organizational culture literature has identified three main elements, shared values, beliefs and behavioral norms, as being necessary in order to develop and maintain a strong organizational culture (Ullah and Lai, 2013b). This paper introduces seven different organizational factors which are taken from business/technology aligment and green computing literature: relationships, understanding, communication maturity, shared values, meeting of minds, leadership and belief, with each factor representing a specific cultural aspect in the context of green computing and building a suitable business environment as shown in Table 2.

IV. CONCLUSION AND FUTURE WORK



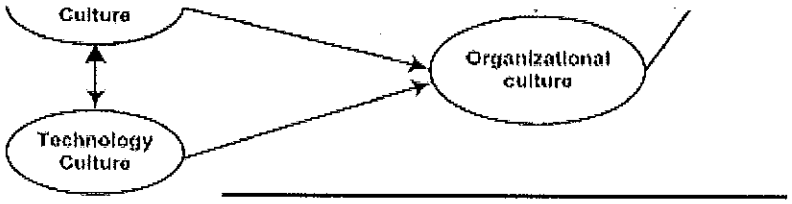


Figure 1: Green computing framework for business sustainability

In contemporary society, information and communication technology has become essential to organizational survival. This increasing demand for technology means that technology companies are able to introduce newer and faster devices and software applications on a continuous basis, which potentially help business organizations gain market share and improve their profit margins. However, the benefits of information and communication technology are also accompanied by problems along a range of axes, including environmental and sustainability issues. Green computing is proposed as one positive means of engaging with these environmental and sustainability challenges.

In this paper, drawing on a broad range of literature about business and technology, we have presented a proposed theoretical framework in the context of business/technology alignment and green computing, as a means for exploring what organizational structures and processes will facilitate the adoption of green computing. Three types of association, as presented in Figure 1, (namely the interaction between business and technology strategies, the interaction between business and technology structures, and the interaction between business and technology cultures) have been proposed in order to build a suitable business environment and measure the concept of green computing in any type of business organization. A major contribution of this model is to suggest that all of these factors and their relationships and interactions need to be considered. It is not sufficient or appropriate to consider these factors individually or in isolation. It is the interactions and relationships between business and technology strategy, structure and culture that need to be analysed.

Further, for green computing to be introduced successfully, awareness of these interactions needs to be central to organizational information and communication processes. However, the framework has not yet been tested. As such, the next step in this research will be to undertake a survey of organisations across sectors around green computing. This survey will be based on the theoretical concepts identified in the proposed model, and will thereby enable us to evaluate and further develop the framework with industry data. This empirical process will enable us to both enhance the framework and to further investigate the area of green computing and sustainable organizational practice.

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