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# BREAKING THE IRON LAW: IMPLEMENTING COST EFFECTIVE, GREEN ICT IN THE UK PUBLIC SECTOR

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# **BREAKING THE IRON LAW: IMPLEMENTING COST EFFECTIVE, GREEN ICT IN THE UK PUBLIC SECTOR**

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## **Abstract**

*Public sector information and communication technologies (ICT) cost taxpayers in the United Kingdom (UK) over £16 billion annually and are responsible for between 35-38% of ICT-related Greenhouse Gas (GHG) emissions. While the UK's Greening Government ICT Strategy is regarded as an exemplar in regard to the latter, the Government ICT Strategy addresses the former in terms of eliminating the unnecessary proliferation of ICT applications and infrastructures that resulted from recent e-Government and Transformational Government strategies. Thus, given the crisis in public finances, the Government ICT Strategy aims to reduce ICT-related costs and to improve service delivery, while reducing GHG emissions. This paper's field study of the UK government's ICT strategies draws upon institutional theory for its mechanism-based conceptual framework. The findings of this study delineate the institutional mechanisms that underpin strategy implementation and enable the attainment of strategic objectives. While the study has several significant implications for research and practice, one notable finding is that contrary to the 'iron law' of climate policy, the UK government's focus on ICT-enabled GHG emissions reductions did not diminish with the economic downturn, as the cost savings associated with the introduction of efficient, Green ICT provided sufficient justification for the required infrastructure investment.*

*Key Words: ICT Strategy, Energy, Greenhouse Gas (GHG) emissions, Institutional Theory, Social Mechanisms, Qualitative Field Study*

# 1 Introduction

In the United Kingdom (UK), the public sector has a 35% share of the information communication technology (ICT) market, with annual expenditures of over £16.9 billion. This study found that the primary reasons for this comparatively high share of the ICT market and related costs were the adoption of e-government and the implementation of the UK's Transformational Government Strategy—both of which led to the unnecessary proliferation and duplication of ICT applications and infrastructures across the public sector. One consequence of this is that public sector ICT accounts for approximately 38% of the 4.7% of the UK's ICT-related GHG emissions. In order to bring ICT-related GHG emissions in line with government targets, the UK government instituted the Greening Government ICT strategy in 2008. This initiative won much praise from the Organization for Economic Cooperation and Development (OECD) and the European Commission, among others. For example, a recent report by the OECD assessed 50 government-sponsored ICT-based environmental programmes across 22 OECD countries (OECD, 2009). Of the OECD countries studied, Japan, Germany, Denmark, the US and the UK had programmes that provided clear objectives, hard targets, and monitoring in their national strategies on the use of Green ICT. The recent economic downturn and concomitant crisis in the public finances led the UK government to focus its attention on bringing cost and operational efficiencies to its ICT infrastructures through its Government ICT Strategy 2010; this strategy builds on and incorporates the former Greening Government ICT Strategy.

This paper's objective is to develop mechanism-based, theoretical explanations of how the cost savings associated with direct, enabling and systematic effects of Green ICT (OECD, 2010) were realised in the UK public sector. We first develop a theoretical framework of the social and institutional mechanisms that institutionalize change in organizations and organizational fields (cf. Campbell, 2004, 2005). We then apply the model to interpret the findings from our field study of the UK public sector, which focuses on the institutionalization of the energy- and cost-saving effects of Green ICT to meet the UK government's ICT-related strategic objectives. The paper therefore makes several contributions to emergent mechanism-based theorizing in the IS field and, also, to practice.

## 2 Theoretical Foundations

Our theoretical foundations draw upon the work of institutional and organizational theorists that place emphasis on the development of mechanism-based, explanatory, mid-range theory (see Campbell, 2004, 2005). A compelling argument for the application of institutional mechanisms is made by Campbell (2005, p. 63): "The advancement of social theory, particularly theories of institutional change, depends in part on our ability to identify mechanisms of social change that apply broadly to different realms of society." The following sections delineate the conceptual elements of our theory: this posits that institutions, social entities and/or agents apply *coercive*, *normative*, and *cultural-cognitive mechanisms* to institutionalise change in an organisational field so that constituent organisations will leverage the direct, enabling and systematic effects of Green ICT.

### 2.1 Institutional Change

Our conception of institutional change draws on several perspectives from institutional theory. For the purpose of this paper, the process of institutionalization in and across an organizational field involves the complex, continuous interaction of regulative, normative and cultural-cognitive forces from the broader societal field, as well from within the field itself (Scott, 1995). Drawing on Tolbert and Zucker (1996) and Oliver (1992), we posit that following '*precipitating jolts*' from societal and organisational fields, institutional structures and processes are subject to (1) Deinstitutionalization; (2) Pre-institutionalization; (3) Semi-institutionalization; and (4) Full-institutionalization. Pre-institutionalization involves individual organizations in a field innovating in order to arrive at viable solutions to essentially novel or local problems. This may first involve the deinstitutionalization of

extant structures and processes. In semi-institutionalization, new structures and processes have been ‘theorized’ as being appropriate to solve the problems at hand. These structures and processes are subject to objectification and are diffused (initially by *mimetic mechanisms*) among key participants in the field, then by dominant members using *normative* and other *cultural-cognitive mechanisms*. Full institutionalization occurs when structures and processes become sedimented in and across a field (cf. Tolbert and Zucker, 1996). Each of these stages is evident in the UK’s ongoing transition from unsustainable, inefficient ICT to efficient, cost-effective, Green ICT. However, this precise academic conceptualisation bears no relationship to what happens in reality, as new ‘jolts’ emerge from the environment and a web of mechanisms act to produce the effects associated with each stage. Our analysis attempts to capture the complexity of such mechanisms and explain them.

## 2.2 Social and Institutional Mechanisms

According to Gross (2009, p. 364) “A social mechanism is a more or less general sequence or set of social events or processes analyzed at a lower order of complexity or aggregation by which—in certain circumstances—some cause X tends to bring about some effect Y in the realm of human social relations. This sequence or set may or may not be analytically reducible to the actions of individuals who enact it, may underwrite formal or substantive causal processes, and may be observed, unobserved, or in principle unobservable.” Gross argues a social mechanism may be defined in terms of actors, their habits of cognition and action, related resources, and the responses they make when faced with a problem situation. This study applied Gross’s conception of social mechanisms in interpreting the empirical findings. In their comprehensive review article, Mignerat and Rivard (2009) illustrate how IS researchers employ *coercive*, *normative* and *mimetic mechanisms* to explain ICT innovation, the adoption and use of IT, and the development and implementation of IS. Nevertheless, while all employ institutional theory, none of these IS studies manifestly employ a mechanism-based perspective to enhance their explanatory power. This study addresses this lacuna by building on, and extending, the aforementioned macro-level institutional mechanisms through its explicit adoption of a mechanism-based perspective. Furthermore, its use of meso-level mechanisms, identified and corroborated by leading institutional theorists, provide explanations of institutional change in organizational fields with a greater degree of granularity than that provided by extant IS research.

Mechanisms	Description
Coercive Mechanisms	These operate through the exercise of legislative, judicial, social and organizational power, and function through governance or power systems. It must be noted that the use of these and other mechanisms imply the use of monitoring as a meso-level mechanism.
Normative Mechanisms	These are a function of values and norms exercised by professional and standards bodies, non-government organizations (NGOs), consulting organizations, professional bodies, academic institutions and publications, etc. which what is desirable should be achieved by actors.
Mimetic (Cultural-Cognitive) Mechanisms	These involve the imitation of other social entities in social, institutional or organizational contexts. In the face of uncertainty, organizations imitate the structures, protocols, routines, and so on, of other, apparently successful, organizations in a field. A <i>mimetic mechanism</i> is one type of cultural-cognitive mechanisms that collectively bring about various types of institutional outcomes.

Table 1 Macro-Level Institutional Mechanisms (Adapted from Scott 1995, Campbell, 2005)

*Coercive*, *normative* and *mimetic (cultural-cognitive) mechanisms* shape the outcomes of the process of institutionalisation in societal and organizational fields and organizations (Di Maggio and Powell, 1983; Scott, 1995). Table 1 describes each of these mechanisms in detail. Following Campbell (2004) we categorise these as macro-level mechanisms, each of which are associated with fundamental meso-level mechanisms. Campbell (2004, 2005) employs both macro- and meso-level social and institutional mechanisms to help explain institutional change in a variety of research contexts, whether it is mechanisms involved in shaping organizational reproduction of change due to globalisation, or

collective action in organizations and social movements. Table 2 defines and elaborates these mechanisms. Thus, macro- and meso-level mechanisms provide this study with a rich conceptual schema to help explain the institutionalisation of the direct, enabling and systematic effects of Green ICT in the UK public sector.

Mechanisms	Description
Political Opportunity Structure	Formal and informal political conditions that encourage, discourage, channel or otherwise influence the activities of entities in an organizational field.
Strategic Leadership	Institutional Entrepreneurship is exercised by social actors who decide on which direction a social, institutional or organizational entity should take.
Network Cultivation	Involves creating social and institutional movements and associations.
Framing	This involves the use of metaphors and symbols which influence how issues are perceived and which inform social action in the context of socially constructed realities.
Diffusion	Refers to the dissemination of concepts, social structures, and practices, mainly through social networks.
Translation	Refers to how diffused concepts and ideas are transformed for application in new social contexts.
Bricolage	Involves the recombination of concepts, practices, etc. from other social contexts to produce new forms of social activity.

Table 2 Meso-level Institutional Mechanisms (adapted from Campbell, 2004, 2005)

### 2.3 Direct, Enabling and Systematic Effects of Green ICT

The term Green IT was coined by practitioners to differentiate ICT artefacts that are designed with environmental sustainability in mind; however, we adopt a broader conceptualisation. Both the OECD and the Global eSustainability Initiative (GeSI) refer to the direct and enabling effects of Green ICT to enable energy efficiency, lower energy consumption, reduce GHG emissions, and to realize other sustainability objectives (GeSI, 2008; OECD, 2009). The OECD (2010, p. 192) expand on this basic categorisation and argue that the “resulting environmental impacts [of ICT] are more difficult to trace but need to be part of a comprehensive analytical framework...categorised in a framework of three analytical levels: direct impacts (first order), enabling impacts (second order) and systemic impacts (third order).” Specifically, these are: (a) **Direct or First Order Effects**, This refers to positive and negative impacts due to the physical existence of ICT products (goods and services) and related processes; (b) **Enabling or Second-order Effects**, Green ICT applications can reduce environmental impacts across economic and social activities; and (c) **Systemic or Third-order Effects**, these promote and underpin behavioural change in individuals, business enterprises, and society these changes are fostered by Green ICT applications.

## 3 Research Design

The starting point for our analysis of Green ICT-related, field-level institutional change in the UK public sector was to identify the relevant period of interest (e.g. from 2008-2011). The second issue was to define the composition of the organizational field in terms of participating actors. The third challenge was data gathering. The organizational field of the UK public sector includes government departments, state-sponsored bodies, various agencies etc., down to local authorities; these organizations obtain the services of, and collaborate with, private sector organizations, especially IT vendors, consultants, etc. Also of relevance are non-government organizations (NGOs) and other stakeholders. Our research design was based on three inter-related, but not necessarily sequential, qualitative data gathering cycles that focused on key periods of institutional change. This involved data gathering from over 1000 sources of direct and indirect relevance, length and depth, including: (1) 77 conference presentations and seminar sessions at the following industry-based conferences; Green IT Expo 2009, Government ICT Goes Green Conference 2010, Efficient ICT: Greener Government 2011, and the European Commission’s ICT for Energy Efficiency (ICT4EE 2010)

conference, each of which were attended by the researchers; (2) 29 formal and informal interviews of key informants drawn from case studies on two organizations (Bristol City Council and Manchester City Council) and public administrators presenting and attending the conferences; and over 897 documents and journal articles. The data was interpreted with respect to our mechanism-based conceptual framework and analysed using content analysis and the constant comparative method (cf. Patton, 1990). The following field study narrative presents the this study's findings while making explicit references to the social and institutional mechanisms that manifestly and latently bring about first-, second- and third-order effects.

## **4 Institutionalizing Efficient, Green ICT in the UK Public Sector**

This section provides a mechanism-based explanation of the four stages of institutionalization of Green ICT in the UK public sector viz. Stage 1, precipitating jolts that triggered institutional change; Stage 2, pre-institutionalization of the direct, enabling and systematic effects of Green ICT; Stage 3 and 4, Semi- to Full-institutionalization of these effects.

### **4.1 Stage 1: Precipitating Jolts and Deinstitutionalization of Inefficient ICT in the UK Public Sector 2003-2008**

In the early years of the new millennium, the European Union placed much emphasis on the use of ICT to promote economic growth and to transform the delivery of public services (European Commission, 2003). This EU policy on e-Government constituted both a *participating jolt* and a *political opportunity structure mechanism* that coerced EU governments to adopt or accelerate their e-Government programmes. While the UK was an early adopter of e-government systems, it also implemented a field-level *Transformational Government Strategy* whose aim was to transform the delivery of public services using ICT (cf. Cabinet Office, 2005). This is an example of the exercise of *strategic leadership* and the use of *political opportunity structure mechanisms* by the UK. However, evidence from the field study indicates that an unintended consequence of the adoption of e-government initiatives and the execution of the *Transformational Government Strategy* was a proliferation of similar ICT applications across government departments, agencies, and local government/service organizations. Thus, the carbon footprint and the total cost of ownership (TCO) of ICT infrastructures grew exponentially throughout this period. A combination of EU-based regulations (*coercive mechanisms*), such as the EU's Emissions Trading System (ETS), WEEE, RoHS, and EuP Directives, acted as *political opportunity structure mechanisms* (e.g. policies on the application of Green ICT), which in conjunction with *normative* and *cultural-cognitive mechanisms* (from the OECD, various social movements and NGOs, and the Nottingham signatories) focused the attention of UK politicians and public servants (local and national) squarely on environmental issues. The EU Commission were also, however, using *cultural-cognitive mechanisms* such as *framing* and *diffusion* to make its environmental policies socially and economically acceptable (social movements were also busy in this regard, cf. Giddens 2009). Hence, this complex web of factors and influences shaped the institution of the UK's Climate Change Act and the Energy Act in 2008, concomitant with the Greening Government ICT Strategy, also in 2008. However, it must be noted that the Sustainability on the Government Estate (SOGE) Strategy had already been instituted in 2006. Nevertheless, the former was the first formal policy document on the use of Green ICT in the UK public sector. Interestingly (and in support of our thesis), it had identifying "Green ICT standards and measurement criteria for discussion and agreement with ... the European Commission" as one of its key activities (Cabinet Office 2008, p. 9). Also of interest is that progress on the implementation of the Greening Government ICT Strategy was reported in the Transformational Government Annual Report: subsequently, it also underpinned much of the implementation of the SOGE strategy, as will be adduced below. Hence, the UK government began the process of employing the mechanism of *strategic leadership* in deinstitutionalising energy inefficient ICT practices and infrastructures.

## 4.2 Stage 2: Pre-institutionalization: Greening Government ICT Strategy

At the time of its inception in 2008, existing government programmes such as the Transformational Government (2005) and Sustainability on the Government Estate (SOGE, 2006) strategies, were instituting, or planned to institute, several of the enabling and systematic effects of Green ICT. (Discussion on the Digital Britain Strategy began in 2004-2005 and occupied the minds of policy makers in this area.) Given the direction of government policy on climate change, the Chief Information Officer Council (CIOC) instituted the Greening Government ICT Strategy. This strategy was the first explicit attempt to leverage the direct, enabling and systematic effects of Green ICT. As such, this new strategic policy would underpin and 'Green' extant ICT-enabled strategies. However, the strategy did not act as a *coercive mechanism*, in that sanctions for non-compliance were not specified, and there was, as indicated, much scope given to public sector organizations to make progress in leveraging the direct, enabling and systematic effects of Green ICT. The Government Chief Information Officer (CIO) had responsibility for driving the implementation of the strategy through the CIO Council (CIOC) and Chief Technology Officer Council (CTOC). In order to implement the strategy, the CIO council instituted the Green ICT Delivery Group (GDU). These three entities were, and still are, instrumental in translating policy into action across the public sector with respect to the different strands of ICT strategy. The CIOC and GDU delineated the strategic actions to be taken in 2008-2009 and the strategy outcomes to be attained in keeping with overall government objectives on sustainability and climate change (cf. Cabinet Office 2008, 2009). They also indicated the direct, enabling and systematic effects of Green ICT that result from the execution of strategy.

Several GHG emissions-related high-level outcomes had already been defined by the UK government in 2008 when it launched its Greening Government ICT Strategy. For example, that the key outcome of the Sustainable Operations on the Government Estate (SOGE) Strategy was to have the government building estate to be carbon neutral by 2012. In 2008, the UK Government stated that the overarching target for GHG reductions was over 26% by 2020 and at least 60% by 2050. The Greening Government ICT Strategy articulated two ICT-related overarching outcomes: (1) To have all government ICT become carbon neutral by 2012 and (2) to have Government ICT carbon neutral across its lifecycle by 2020. The strategy was the first attempt to harmonize Green ICT policies and outcomes across the range of IT-enabled government strategies.

The Greening Government ICT Strategy was emergent in both its articulation and execution. At the Green IT Expo Conference 2009, HM Government Green ICT Champion stated that "...the first stage of the strategy was to tackle the environmental footprint of ICT, while the second stage of the strategy was to use ICT to reduce environmental footprints across Government." This is a direct reference to the objective of leveraging "low hanging fruit" of the direct, and some of the enabling effects, first and then move on to the systematic effects. Government departments and other public sector entities were to implement "as many actions from 'Areas for ICT Carbon Reduction'...as are practicable and necessary to deliver the strategic objectives above" (ibid.). Specifically to: (a) Extend the lifecycle of all ICT purchases; (b) reduce the overall number of PCs and laptops; (c) implement a range of active device power management features; (d) reduce the overall number of printers; and (e) increase average server capacity utilisation to achieve a minimum of 50% where possible. The GDU proposed 18 Action Points that CIOs would be scored on in the efforts to achieve the government's strategic objectives (a combination of *coercive* and *monitoring mechanisms*). In addition, while it is clear that direct effects were targeted initially, the strategy also operated as an important *political opportunity structure mechanism* for organizations that also sought to leverage the enabling effects. For example, organizations were encouraged to deploy Green ICT to help implement related strategies such as SOGE, which focuses chiefly on the sustainable use and energy efficiency of buildings and transport. In considering SOGE Areas and Actions, it becomes clear that the applied focus of Green ICT seeks to lower GHG emissions chiefly through the enabling and systematic effects of Green ICT, but also through direct effects. Intellect (2009) published a series of case studies of UK public sector organizations that achieved Green ICT-enabled SOGE objectives in mobile and tele-working, intelligent transport and smart buildings—the latter two involving the use of Green IS.

One of the most significant early milestones in the Greening Government ICT project was that the CIOs and CTOs worked with the Gartner Group (i.e. employed *network cultivation, translation and bricolage mechanisms*) to develop a Green ICT Scorecard. This is a web-enabled, dashboard-based, Green IS whose purpose it is to measure and report on organizational Green ICT performance across several dimensions (i.e. a *monitoring mechanism*). Thus, it acts as *framing, diffusion and monitoring mechanisms* for Green ICT practices that are deemed appropriate—in other words, it has a *coercive* dimension as well as *normative* and *cultural-cognitive* aspects. In order to build the scorecard 8 operational policy dimensions, from Green Policies to Behaviours, are mapped unto 3 high-level dimensions viz. Corporate Social Responsibility (CSR or Sustainable Development Policy), Green IT Policy, and Technology Optimization. The underlying scorecard logic is based on 310 questions, metrics and measurements. The top-level dashboard indicates how the participating government organizations (department, agency, city council) are performing relative to others in the Gartner database; it also provides a Green Opportunity Map that highlights key areas of improvement, from high to Low. However, feedback from CIOs participating in our research indicated that the real benefit of the scorecard was its ability to develop internal action plans and communications. The Green ICT Delivery Unit drew on the experience of developing this Scorecard to develop a related Green ICT Scoreboard, which, consists of 18 Green ICT actions for public sector CIOs to implement directly. However, it is significant that these are a subset of 52 CIO action points, with 31 action points focused on the PC/Laptop use and office ICT, and the remaining 21 concerning data centre operations.

The strategy document was pragmatic in that it recognized, albeit implicitly, the need for *network cultivation mechanisms* to be applied across departments, industry, Government CIOs and CTOs, and other stakeholders, such as NGOs, consultancy organizations and IT service providers in order to attain, and then go beyond, identified “Quick Wins”. The latter were the 18 Green ICT actions that all CIOs had to implement but again sanctions were for non-compliance were not specified, although this was an effective *monitoring mechanism*. Existing relationships with the government-sponsored Carbon Trust NGO were formalized and extended to ensure independent GHG emissions analysis and measurement services and related advice to CIOs and their organizations (another *monitoring mechanism*). Another NGO, Salix Finance, was instituted by the government to provide “loans and ring-fenced conditional grants to make effective, long-lasting carbon saving projects happen in the public sector.” Thus, organizations that had difficulty in raising finance for Green ICT initiatives from their existing revenues or budgets had another vehicle for securing investment in ICT. It was also intended that Salix Finance would support *institutional entrepreneurs* that wished to innovate and exercise the mechanism of *strategic leadership* in promoting Green ICT.

Other examples of the influence of *network cultivation mechanisms* and their effect comes from the input into the formulation of the strategy and its execution came from the British Computer Society (BCS, on data centre efficiency and leading implementation of the Code of Conduct for Data Centres), the British Standards Institute (on PAS 2050 and GHG accounting), the European Commission and the European Joint Research Centre (on the Code of Conduct for Data Centres), and the US Government (EPA and the Green Electronics Council on EPEAT standards on Green Procurement). Individual public sector organizations also developed network links with other consultancy/ICT service providers; e.g. the relationship between the Environment Agency and Capgemini is particularly notable, where the latter advised and managed the outsourcing of the agency’s ICT needs and co-developed a Green ICT Maturity Model.

While the UK Government has largely eschewed the use of *coercive mechanisms* to institute change in the public sector, its ambitious GHG targets for the UK meant that all large organizations, private and public, had to make concrete efforts to reduce emissions. Thus, the Carbon Reduction Commitment (CRC) Energy Efficiency Scheme came into being in 2008 as a national *coercive mechanism*. The CRC Scheme means that all government departments and many agencies and local authorities must now legally account for and reduce Scope 1 and Scope 2 GHG emissions. It must be noted that such organizations will be able to comply by meeting the Green ICT and SOGE-related targets outlined above—the problem for many organizations is achieving these targets by 2011/2012. Only time will



tell if this strategy will fall victim to Pielke's (2010) 'iron law' of climate change, which basically posits that policies on emissions reduction will lose out to those focusing on growth in economically straightened times.

### **4.3 Stage 3 & 4: From Semi- to Full- institutionalization: The Government ICT Strategy 2010**

In an organizational field as extensive as the UK Public Sector, it will be some time before the direct, enabling and systematic effects of Green or Efficient ICT are fully institutionalized. This is reflected in comments made by the Deputy Chief Information Officer for the Cabinet Office in 2011. However, there is evidence that the majority of these effects are institutionalized in certain islands of 'Green' in central and local government organizations. We now provide evidence for this and offer mechanism-based explanations for how these effects were institutionalized and related cost-savings achieved.

#### **4.3.1 New Precipitating Jolts**

The crisis in the banking and financial sectors in 2008 had a significant negative impact on government finances; however, the dying days of the Labour government saw little effort to address the implications for the public sector. Further deterioration in 2009 brought the need to make cost savings uppermost in the development of public policy; however, addressing these problems were left to the incoming coalition government of David Cameron and Nick Clegg, with its marriage of the Conservative Party and Liberal Democrats perspectives on the public sector. Both these events were significant *precipitating jolts* that could have led to application of the 'iron law'. For example, it would be expected that in recessionary times the UK government would abandon its Green ICT strategy and related investment or, indeed, shelve its CRC policy. Instead, it accelerated and expanded the former, while the fate of the latter is moot. The rationale for this was noted viz. "In the end, the outcome is fairly straightforward. By tightening the spend activities on IT programmes, and making the green element more solid in what we are doing, we will save money. We will actually provide a return on the investment in IT in a greater way and hopefully drive a Green ICT through a fiscal and financial element that mutually support one another" (Deputy Chief Information Officer, Cabinet Office, Sept. 2011). This was underscored by the Deputy CIO of Her Majesty's Revenue Commissioners (HMRC) who stated that "there is an obvious link between efficiencies and savings in terms of 'Green'."

#### **4.3.2 Old Light Through New Windows: The Government ICT Strategy 2010**

This emphasis on minimizing costs and maximising Green ICT is apparent in the Government ICT Strategy 2010. This strategy was the direct result of the realization that the uncoordinated and uncontrolled growth in the application and use of ICT across the public sector from 2000 on led to heterogeneous ICT infrastructures and unnecessary duplication in terms hardware and software deployment across government organizations. One of the unintended consequences of this strategy was that it helped identify areas for even greater savings in terms of cost, energy and in reducing GHG emissions. However, this strategy document is revealing in that outcomes are expressed in terms of cost savings to be achieved and not ICT-related emissions reduction figures. This is a deliberate *'reframing'* of stakeholder perceptions, given the significant budgetary cuts that would have to be made to UK finances. However, the public sector administrators, managers and professionals attending the Greening Government ICT Conference in September 2010 clearly took a pragmatic stance and spoke interchangeably about cost and emissions reductions. This interpretation was confirmed at the Efficient ICT: Greener Government 2011 conference. In a seminar suitably titled "The Business Case for Green ICT in an Austerity Age", Capgemini's Infrastructure Services Sustainability Lead pointed out that the major strands of the Government ICT Strategy 2010, although positioned as cost reduction measures, were actually key Green ICT initiatives. This approach is in keeping with that of Anthony Giddens (2009) who argues that achieving GHG emissions reductions

with energy efficiencies and related cost savings as an overarching rationale is a practical approach to the problem.

Thus, the Government ICT Strategy 2010 was a *political opportunity structure mechanism* that signalled a change in emphasis, which, at first glance, might have given stakeholders concern that the UK Government had watered down its Green ICT strategy and its commitment to GHG emissions reductions. Essentially, the strategy document also acted as a *re-framing mechanism* where the benefits of the various ICT-based strands were expressed in cost reductions as well as GHG emissions savings. Evidence adduced from actors across the public sector indicated that their commitment to Green ICT policy had not changed: indeed, we concluded that the new strategy presented them with new opportunities for action. The Deputy Director, ICT Strategy and Policy, UK Cabinet Office confirmed this and stated that the purpose of this strategic mechanism was to help “Cut carbon emissions in central government by 10% in 2010, help decarbonise the economy and to support creation on new green jobs and technologies.” She added that despite the change in administration and the budget cut-backs that “Green ICT had a real part to play.” In 2011 the Assistant Head, Strategy Implementation, CIO Information Strategy and Policy Team confirmed this and stated that “...in May last year David Cameron stated that he wanted this to be the ‘Greenest government ever’ and since then the Government has committed to reducing carbon emission by government by 25% by 2015 and this ICT strategy supports that strongly.”

#### **4.4 Progress to Full-Institutionalization**

The evidence from the UK Public Sector in 2011 is that the execution of the Government ICT Strategy is in lockstep with the Green Agenda at local and national levels. The UK Government and key government departments are continuing to exercise the mechanism of *strategic leadership* in highlighting opportunities for using Green ICT to achieve policy goals of cost reductions. For example, in 2011 the Deputy CIO of Her Majesty’s Revenue Commissioners (HMRC) stated that “our 13 Machine Strategy will reduce over 600 applications to 150 and put them on to 13 strategic platforms...fundamentally we are using what we have and driving decommissioning to take cost out of the organization...The transformation is by using what we have, not buying loads and loads of new things.” He recounted that “We delivered over £1 m worth of savings by a simple task of putting machines to sleep at night...and to wake them up in the morning. So 80-odd thousand workstations are powered off centrally and come back on in the morning ready to start using.” He also noted “we’ve replaced our desktops. 25,000 desktops have just gone in saving 650 tonnes of carbon... We’ve changed all our printers to multifunction devices.” Since 2008, HMRC reduced its server estate by 30% and shares its video conferencing platform with other departments. HMRC also performed extensive modelling of its carbon footprint and discovered that its communications or ‘comms’ rooms accounted for 60% of its IT-related emissions—these facilities are in the process of being consolidated to reduce this energy drain in this and other departments.

Central to the attainment of these achievements were the *mimetic mechanisms* of *translation* and *bricolage* of established industry concepts, in everything from thin clients to server virtualisation and consolidation, to tele-commuting, teleconferencing, and so on. This is particularly true in the area of cloud computing and applications stores. The influence of industry vendors is particularly in evidence (e.g. IBM, Accenture, HP, EMC2, Capgemini), as a product of the application of *network cultivation* and *diffusion mechanisms*. However, in the broader environment the Japanese Government’s Kasumigaseki Cloud and the US Government’s cloud-based storefront of configurable applications appear to be influential as *mimetic mechanisms* in government thinking on the cloud architecture. In providing the context to the degree of savings to be realized the Deputy Director of the G-Cloud Programme, argued persuasively in 2010 for the need to consolidate servers and move to a G-Cloud architecture: take, for example, he recounted that there were over 200,000 servers in operation across the public sector, running over 10,000 applications in over 120 data centres, in addition to servers running in data communications rooms. Furthermore, he stated that over 90,000 of the central government servers run at less than 10% load. These points were elaborated upon in 2011 by Deputy

Chief Information Officer, Cabinet Office, who stated that central government was in the process of reducing the aforementioned 120 data centres to just 10-12—he argued that the Cloud strand of the government’s strategy is vital to achieve this target. Evidence that government departments are moving towards a G-Cloud platform comes from the Deputy CIO of HMRC who stated that his department was already using Cloud technology to “lower energy usage...that’s delivering about 25% in our datacentre cost, and it is the defacto standard in everything we do going forward.” In addition, this department provided ample evidence that it is implementing the Open Source, Open Standards and Reuse Strategy elements. Here the *mechanism of translation* of international and local initiatives is at play (further evidence of this is adduced below). We now turn to one important dimension to Government ICT strategy that is often overlooked—ICT outsourcing and procurement.

#### 4.4.1 Green ICT Outsourcing in the Public Sector

About 65% of the management, operation and delivery of the Government ICT in the UK is outsourced to private sector organizations (Cabinet Office 2010). Hence, this is a key area for cost and GHG emissions reductions. In late 2009, The Environment Agency entered into what its Head of Innovation and Architecture stated was “the most sustainable ICT contract in the public sector.” In implementing this strategy the Environment Agency is set to reduce ICT-related GHG emissions by around 50 percent by 2012. Capgemini was chosen from among a field of vendors due the maturity of its Green ICT credentials and sustainability of its supply chains. This initiative is considered an exemplar by both public and private sector organizations. In order to translate policy into action, and applying the *bricolage mechanism*, the agency put together a rigorous selection framework using existing protocols along with additional environmental measures built in from the outset viz. (a) Supplier’s organizational credentials and credibility as a sustainable ICT service/outsourcer; (b) Supplier’s approach to risk management for sustainability (use of Environmental Management Systems, particularly ISO14001); (c) Supplier’s use of a sustainable supply chain (contractual flow down to subcontractors, sustainable suppliers, sustainable transport, Scope 3 emissions, use of sustainable and ethically sourced materials); (d) ICT Asset Provisioning standards (EPEAT Gold, packaging, Assistive Technology); and (e) Supplier Behaviours (re-use, minimise travel to Agency/customer sites). This framework acts as a *coercive mechanism* for supplier compliance. In reflecting on his experience to an audience of government CIOs and other IT professionals, and in the absence of a framework such as that possessed by the Environment Agency, Capgemini’s Infrastructure Services Sustainability Lead’s advice was “In terms of contracting with you suppliers, don’t be afraid to challenge them...they will step up to terms and conditions...things like ISO14001 accreditation that should be mandatory in your contract: how can you be sure that your supplier is managing environmental risk if they don’t have ISO 14001?...In terms of the supply chain, if you are dealing with a prime contractor are your criteria going down the chain to subcontractor. In terms of standards, EPEAT Gold is the thing to go for but it does not cover everything...then there is packaging and compliance with packaging regulations...I know that Leeds City Council gets their desktops delivered packaging free, delivered on pallets...then there is take back and recycling and WEEE.” These criteria map unto those use by the Environment Agency in vetting suppliers. They also have significant implications for outsourcing and ICT service vendors providing the UK Government with Green ICT to meet 65% of its ICT needs. Hence, the success of the Energy Agency’s approach, which is considered an archetype by other private sector organizations, is explained by the application of *translation* and *bricolage mechanisms* where extant government and industry approaches to procurement and outsourcing were applied to create an exemplary approach. This has ramifications for the Greening of the ICT industry in the UK, as *coercive mechanisms* (rigorous contracts and service level agreements (SLAs)) will be applied to have to ICT service providers ‘Green’ their operations if they are to secure and retain lucrative government contracts. Indeed, the Energy Agency’s application of *strategic leadership* and *diffusion mechanisms* was clearly in evidence at the Greening Government ICT Conference as actors used formal presentations and informal seminars to transfer the lessons they learned across the organizational field of the UK public sector.

## 5 Discussion and Conclusions

The transformation of the UK public sector using e-Government and ICT to underpin its front- and back-office processes was undoubtedly a success. The unintended consequences of the UK's e-government and transformational government strategies was, however, an unplanned proliferation of ICT applications and infrastructures, with massive duplication of effort and redundancy being the norm, rather than the exception, across the public sector. This introduced technology-, cost-, and energy-related inefficiencies that led to concern about associated GHG emissions. According to Gross's (2009) mechanism-based theory, actors (senior public servants, inc. CIOs, etc.) habitually formulated high-level strategies to solve these problems, while drawing on internal and external resources (structures, processes, and external actors such as consultants and ICT vendors). Thus, we conceptualise the Greening Government ICT Strategy and the Government ICT Strategy as macro-level *political opportunity structure mechanisms* that possess *coercive* (as government policies), *normative (diffusion)* and *cultural-cognitive (framing, translation, bricolage)* dimensions. The translation of strategy into action saw the application of a complex web of other macro- and meso-level mechanisms aimed at making public sector ICT Green, energy efficient and cost effective. Early on, the government was praised for its exercise of *strategic leadership* in bringing about institutional change; however, it was also criticised for its failure to comprehensively *diffuse* the concept of Green ICT to practitioners across the field (Global Action Plan 2009; cf. Tolbert and Zucker, 1996): this, we argue, led to a low level of uptake of the strategy in early 2009. The implication here is that the commitments of many ICT managers were not well aligned with those of the authors of the Greening Government ICT Strategy. However, another report released later that year indicated that 110 public sector organizations had indeed made progress (Cabinet Office, 2009). We conclude that this measure of success was achieved through the use of a combination of mechanisms, including *monitoring mechanisms* and *normative mechanisms* associated with the Green ICT Scorecard. Both this report and an independent study by Intellect (2009) provided evidence of the type of progress being made across the public sector in a series of case studies. It is evident that, *diffusion* aside, the objective of these case studies was to enable ICT managers to apply *mimetic mechanisms*, such as *translation* and *bricolage*, in order to emulate the case exemplars in the implementation of Green ICT strategies.

We argue that the *re-framing* of Government ICT Strategy from 'Greening ICT' to low-cost ICT in 2010 had the unintended consequences of instituting the type of energy efficiency behaviours consistent with the objectives of the Greening Government ICT Strategy. From 2010, business and ICT managers cannot avoid action by claiming that energy and GHG emissions do not concern them or because they are finding it difficult to measure and quantify outcomes. Now, CIOs and ICT managers must decrease all ICT-related costs, the most significant of which are energy related—furthermore, traditional budget-based monitoring mechanisms are in place to ensure compliance. As indicated by the findings, rationalizing ICT infrastructures, teleworking, and dematerialisation introduces energy savings, whether it is in reducing the number and occupancy of buildings or obviating the need for travel, all of which reduces GHG emissions. Hence, by using the *coercive mechanism* of compliance with objectively measured cost reduction targets, the UK government is achieving the type of emissions savings required set out in its various strategy documents. Our field study identifies the particular configuration of mechanisms that instituted change, albeit with varying degrees of success, across organizational populations in the UK public sector. We argue that the mixed results observed in this organizational field during the pre- to semi-institutionalisation stages (2008-2009) is associated with the *coercive, normative* and *cultural-cognitive mechanisms* employed, and the individual behaviours of certain public servants and ICT managers, who may have exercised avoidance and manipulation, as opposed to acquiescence in the face of institutional change (cf. Oliver, 1991). Drawing on the findings, we offer a conjecture as to how to field level isomorphism of Green ICT practices was achieved across the UK public sector. In essence, the problem of ICT efficiency needed to be *re-framed* in terms of cost reduction in order to make the consequences of inaction immediate and relevant to extant organizational actors, who then took effective action to bring about

the direct, enabling and systematic effects of Green ICT. This led to a situation where the ‘iron law’ of climate change policy did not hold. Thus, we argue that the ‘iron law of Green ICT’ will tend to govern decision-making in both public and private sector organizations, in that managers’ decisions to invest in Green ICT will be influenced more by cost reductions in IT infrastructures and increased efficiencies in business processes, than by any reductions in Greenhouse Gas emissions.

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