

# **e-Government and patterns of innovation in the public sector**

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**Abstract:** Patterns of industrial innovation and the relationship between innovation and economic development have been a growing area of interest for economists for the last 60 years. The focus of most of this research has been on innovation in industrial settings where the development of new technologies and manufacturing processes have provided researchers with a rich source of data for analysis. More recently, there has been a growing acceptance that more research needs to be undertaken on innovation in the service sector, particularly since services account for approximately two thirds of the gross domestic product (GDP) in developed economies. The adoption and widespread use of new information and communication technologies (ICTs) by service sector firms has been a focus of study for much of this research. Richard Barras's notion of a Reverse Product Cycle operating in the service sector has been useful in helping to understand some of the differences in the dynamics of innovation between manufacturing and service firms. However, much less attention has been paid to innovation in the public sector. The development of e-government programmes and initiatives across a number of developed economies as well as the more widespread deployment of ICTs across the public sector offers some interesting potential for research. This paper examines a range of innovations across the UK public sector and considers the extent to which existing concepts of the innovation process are appropriate in such a setting. Evidence is drawn from a range of case studies emerging from the EU Publin Project and several UK National Audit Organisation studies. It is argued that while Barras's Reverse Product Cycle offers a useful framework within which to consider such innovations, there may be limitations when it is applied to public sector bodies.

**Keywords:** e-Government, innovation, organisational change

## **1. Introduction**

The importance of innovation as a driver of growth within national economies has long been recognised. Writing in 1776, Adam Smith (1986) described the role that improved machinery had on the productivity of a range of manufacturing industries. In the early twentieth century, Joseph Schumpeter (1976) attempted to show the relationship between major innovations such as steam power and electricity and long waves

of economic growth. Studies into the relationship between economic development and patterns of innovation have built on Schumpeter's work with researchers examining the extent to which government initiatives are able to stimulate innovation in the private sector. Most of this research has looked at patterns of innovation within the manufacturing sector where new products and the processes behind their manufacture have been considered. However, more recently there has been a growing literature on innovation within the service sector (Miles 1993, 1999). This is not surprising with the service sector accounting for approximately two thirds of the Gross Domestic Product (GDP) in most developed economies. A focus of much of this latter research has been on the impact that information and communication technologies (ICTs) have had on the operations of service firms, particularly those working in the financial services sector. Much less research has been carried out into innovation in the public sector although this is slowly changing (Borins 2001, Harris 2006). For the purpose of the discussion presented in this paper, an operational definition of innovation is proposed: innovation involves the creation of new products and services as well as the processes required to produce them including organisational realignments designed to change the way an organisation operates internally and in its interactions with customers and suppliers. While this definition acknowledges the more traditional studies into innovation in the manufacturing sector it also incorporates more recent developments in organisational innovation such as those developed in Japan around supply chain re-engineering. It also allows consideration of changes in the way that public bodies operate and interact with their customers.

Section 2 of this paper considers some of the literature on public sector innovation and explores some of the issues that differentiate it from innovation in the private sector. This section considers the significance of e-Government programmes as both drivers and outputs of innovative activity. In section 3, evidence from surveys of public sector innovation within the UK and the European Union is examined and a breakdown of innovation types is presented. Section 4 examines the validity of Barras's (1986, 1990) notion of a Reverse Product Cycle (RPC) operating in service sector firms within the context of public sector innovation and draws on the case studies discussed in section 3. Consideration is also given to research into the deployment of e-services within public bodies and the notion of an e-Government maturity model (Ebrahim et al 2003, Marchese et al 2004, Shackleton et al 2004).

## **2. Innovation in the Public Sector**

As mentioned in the introduction, research into innovation has traditionally looked at the development and diffusion of innovations in the manufacturing sector. This is hardly surprising as these studies began in the early and mid twentieth century when manufacturing was the dominant driver of economic growth in most developed economies. In some ways, it is also easier to study tangible innovations such as new types of machinery used in industrial processes rather than less observable innovations related to organisational change, for example. The work of Abernathy and Utterback (1978) is important in the context of manufacturing innovations because they provide evidence to support their claim that the

development of many innovations follows a similar pattern. They argue, based on a series of case studies, that in the early stages of innovative activity surrounding a new product the innovating firm devotes most of its energy and resources in developing the product itself. This is important until the design of the new product reaches the stage when a “dominant design” could be said to have emerged. With automobiles, for example, the authors show that it took a number of years for the car to evolve from a range of configurations related to its propulsion, steering and transmission to the design that we would recognise today where most cars have 4 wheels, a steering wheel, a gearbox and an internal combustion engine. Once this dominant design has been adopted by the majority of manufacturers, the next step is to work on the processes that go into the manufacturing process so that costs can be reduced and the cars can be sold in an increasingly competitive marketplace. The winners in this stage of process innovations were The Ford Motor Company with its development of the assembly line and General Motors that combined assembly production methods with new management techniques. In the 1980s innovation research began to investigate patterns of innovation in the service sector. The relative neglect of research in this area was observed by Chris Freeman, a founder of the influential Science and Technology Policy Research Unit (SPRU) in the UK:

“This is very unsatisfactory for many reasons, though principally, of course, for the fact that service industries now account for nearly three-quarters of total employment in some industrial countries. A second reason is that they are now deeply affected by new technologies (in particular information technology)..... Organisational innovations in particular have been relatively neglected.” (Freeman 1994, page 489)

The growth in the importance of the service sector to developed economies has been a common feature of economic development in the second half of the twentieth century. Building on Freeman’s point above, the service sector was responsible for approximately 70 per cent of the UK’s Gross Domestic Product (GDP) in 2005 (National Statistics 2006). This includes the public sector which accounted for 18 per cent of UK GDP, amounting to £240 billion. Many studies of service sector innovation have focused on the financial services sector (Hannan and McDowell 1984, Barras 1986, Escuer et al 1991, Ingham and Thompson 1993, Credé 1996) and looked at the adoption and use of new ICTs by firms operating within this area. Of this group of researchers, Barras is perhaps the most ambitious with his attempt to construct the beginnings of a theory of innovation in service sector firms. Barras’s work will be considered in more detail in section 4 within the context of public sector innovation where its relevance will be discussed. A key aspect of Barras’s theory is that service sector innovation tends to follow a reverse pattern of product and process innovation to that observed by Abernathy and Utterback (1978) within manufacturing firms. Barras called this the Reverse Product Cycle where the adoption and deployment of ICTs by companies in the financial sector initially results in process innovations related to back office functions such as the automation of payroll and processing of customer transaction details. Only later, as these firms become

more comfortable with the new technologies, do product innovations such as automated teller machines (ATMs) and electronic banking emerge.

As noted in the introduction, research into public sector innovation has been sparse but is slowly growing as an area of study. E-Government programmes are an important factor in this growth as public bodies integrate new technologies into their organisational processes but also use ICTs to change the way services are delivered to end users. The public sector is not traditionally thought of as engaging in innovative activities and Borins (2001) explains why this may be the case. He describes how success is rarely rewarded within public bodies while failure is often punished severely. This reduces the incentive for public servants to engage in potentially risky activities where they will not receive the financial remuneration from successful initiatives that would be available in the private sector. While failure in the private sector is punished to the extent that there may be financial repercussions, failure in the public sector will often attract the attention of the media, particularly if large sums of public money are involved. This is evident in the UK where stories of financial miscalculation around ICT projects regularly appear in the media. The ambitious £6.8 billion project to upgrade the National Health Service (NHS) IT system is a case in point with stories emerging on a regular basis relating to problems with software development, infrastructure deployment and budget over runs (BBC 2006). It could be argued that public bodies in the UK are more transparent in the way they spend money on ICT projects than firms in the private sector. The publication of public accounts, Freedom of Information legislation and investigations by the National Audit Office (NAO) provide a range of opportunities for public scrutiny not found in the private sector. If this argument is accepted it could be a factor in retarding public sector innovation.

An important driver of innovative activity within the public sector in the UK has been the targets set by central government relating to the increased online delivery of public services. In 2000 the UK Prime Minister, Tony Blair, set a target for e-enabling all public services by 2005 and across the majority of the public sector this target was broadly met (Guardian 2006). Efforts by public bodies to comply with this target resulted in a range of e-Government initiatives and forced the realignment of working practices and service delivery in a number of areas. While it is debatable how much the users of public services have really benefited from these initiatives (OECD 2005), it seems certain they have been a driver of innovative activity within the public sector (Harris 2006) as well as often being innovative outputs in their own right. The following section explores some specific examples of innovation within the public sector and focuses on those related to e-Government initiatives.

### **3. Public Sector Innovation in Practice**

As has already been discussed, innovation can take a number of forms. In the manufacturing sector it may be the development and diffusion of new products or more efficient ways of making those products. Innovation within service firms may relate to organisational changes brought about by the use of new

ICTs through a restructuring of business practices or it may be the development of new services that have emerged from the use of ICTs. In the public sector there are similarities in the nature and type of innovations to those found in the private sector. A report on innovation in central government organisations from the UK's National Audit Office (2006a) presents the results of a survey of innovation types and identifies several forms that these innovations may take:

- Improvements in organisational arrangements and business processes;
- Use of new inputs to stimulate innovations;
- Deployment of new technologies such as ICTs;
- Development of new outputs such as new services for end users.

The survey looked at 125 innovations submitted from a range of UK central government organisations with the Ministry of Defence (MOD) and Department for Trade and Industry (DTI) putting forward the most at 16 innovations each. In this respect, the survey is flawed in that the organisations to whom questionnaires were sent were more likely to report on successful innovations than unsuccessful ones. There is also an issue around what these organisations understand by the word "innovation". According to the survey's authors, of the 126 organisations to whom questionnaires were sent 41 returned no data with some stating, "they did not do innovation". However, the wide scope of the types of innovations submitted and the details provided by the organisations offer a useful insight into aspects of public sector innovation. A significant factor to note is that 67 of the innovations emerged out of the use of new technologies with 25 being directly based on Web-based services. Overall, the financial costs of the innovations ranged from several thousand pounds to almost £1 billion with a median cost of £900,000.

Emerging from the NAO report is a theme of the importance of ICTs to the innovation process within the public sector, particularly the e-enabling of public services which was at the core of e-Government policy during the first half of this decade. Examples include the Land Registry's first steps at allowing the conveyancing process to take place entirely over the Web. Similarly, the Driver and Vehicle Licensing Agency (DVLA) has developed a central driver database which will allow drivers to renew their licences online. While they may not appear to be radical innovations they require significant investments by the organisations concerned with the Land Registry investing £146 million over several years to fully implement the new system. Similar projects can be seen across other public bodies including Companies House, Ordnance Survey, Pension Service and the Passport Service. All these organisations have, to varying degrees, allowed users to access their services online. These initiatives are more than simply having a Web site and making information available to individuals. They are transactional services aimed at providing a more efficient service for users whilst saving costs internally.

Building on their research into public sector innovation in the UK, the NAO published other research (2006b) looking specifically at the role of ICTs in changing the way public bodies operate and deliver services to end users. The report considers best-practice in the use of ICTs to deliver change and innovation within the public sector and uses case studies to highlight how these changes can be managed. While the UK government's 2000 target of e-enabling all public services by 2005 was a driver of innovation in the first half of this decade, the NAO points out the new IT strategy set in November 2005, *Transformational Government, Enabled by Technology*, as a driver for change moving forward. The emphasis is on consolidating successes from earlier projects and providing an even greater level of online interactivity with users.

While the NAO surveys discussed above deal with UK public sector innovations, Koch et al (2006) offer a broader perspective and consider Europe-wide research. Their views are based on the PUBLIN research project which examined innovation in the public sector with a focus on the health sector. Through the use of case studies and interviews with those involved in innovation projects, the project considered a range of issues including drivers of and barrier to innovation. Koch et al. observe that the use of ICTs was a major driver of innovation across a range of projects but for these innovations to be successful, the issue of organisational learning was a key factor. Evidence from the case studies suggests that the use of new technologies to drive innovation relies on expertise within the organisation that has developed through previous experiences with the deployment of ICTs.

#### **4. Conceptualising Public Sector Innovation**

So far, this paper has looked at patterns of innovation across a range of sectors. Research into innovation within the manufacturing has been discussed and, through the work of Abernathy and Utterback (1978), a relationship between product and process innovation was proposed. Differences with the service sector and Barras's (1986, 1990) research into service sector innovation were then examined. Following this, evidence from surveys of public sector innovation from the UK and Europe was introduced and some of the differences between private and public sector innovation were highlighted. This concluding section now considers the suitability of Barras's work as a tool for conceptualising innovation in the public sector.

Although some of the limitations of Barras's notion of a Reverse Product Cycle have been highlighted, specifically its focus on the centrality of ICTs as drivers of innovation (Miles 2001), it still stands as a significant contribution to the innovation literature. His analysis of the relationship between changes to business processes and the development of new services brought about by the deployment of ICTs offers important lessons for studies into public sector innovation. Although at a slower rate than much of the private sector, the public sector in the UK has adopted ICTs into its every-day working practices. Personal computers, email and access to the Web are the norm for those civil servants that require them.

As this familiarity with new technologies has developed and many of the back-office functions of public bodies been automated such as payroll and records management, we have seen the increased delivery of online services. Behind these developments have been policies aimed at streamlining the public sector and the introduction of cost-saving measures. The drive to e-enable all public services discussed above has forced, with varying degrees of success, public bodies to interact electronically with their users in the delivery of services. In this respect, it seems there may be a pattern to innovation in the public sector that is similar to Barras's notion of a Reverse Product Cycle. As administrative functions are automated so it becomes easier to shift the focus of innovation outwards the users of public services. The emphasis for innovative activity within these organisations then moves towards service/product innovation as ways are sought to improve the service outputs. However, an alternative explanation of the ways by which new technologies affect organisational structures within the public sector contradicts Barras's observations of innovation within the banking sector. Based on the maturity model of e-services, this explanation sees innovation moving backwards into the organisation from the initial deployment of web-based services and consequently forcing changes in the ways that public bodies organise their working practices. Ebrahim et al (2003) present a summary of this process and break it down into 4 stages. Stage 1 is based around e-Government programmes and initiatives being focused on the provision of information, typically via web sites where the flow of information is unidirectional from the organisation to the user. Stage 2 is more interactive whereby users can fill in forms requesting more information or possibly take part in discussion forums and other low-level interactive services. In stage 3, the interactions become more transactional with users being able to take part in activities such as e-voting and paying bills online. By stage 4, users should be able to integrate a range of e-services more seamlessly into their lives with more secure transactions and greater online linkages between public bodies. While Ebrahim et al (2004) acknowledge that many organisations have still not reached stage 4, if we accept the premise of the model then it seems to present a different relationship between product and process innovation to that described by Barras in the those parts of the service economy which operate in the private sector. According to Ebrahim et al, for stage 4 to be realised, public bodies will need to restructure the way they manage their operational processes. So while the e-services maturity model, like Barras's Reverse Product Cycle, presents a linear relationship between technological and organisational change, the direction of change is reversed. However, the extent to which this model explains technological and organisational change across all parts of the public sector is not clear. Shackleton et al (2004) have considered its validity within local and municipal public bodies in Australia and concluded that it may be more appropriate at the federal level than at the local level. They argue that the model's linear nature may be too simplistic to be applied across a wide range of organisations adopting a range of different technologies.

## **5. Conclusions**

Despite the attractiveness of Barras's model as an explanation of technology-led organisational change, we need to maintain a degree of caution in applying it to all service organisations. Many of the dynamics that operate in the public and private sectors are different with each experiencing their own pressures and demands from users and customers. The Reverse Product Cycle certainly seems to have a relevance to the banking industry where a series of product and process innovations can be observed over the previous 30 years. However, even in this sector there have been significant changes in the 20 or so years since Barras conducted his research. His model may have some difficulty explaining the rise of off-shoring where new communication technologies have allowed many of the service elements associated with banking services to be provided on different continents from those where the customers reside. The maturity model of e-services provided by public bodies described above also presents a challenge to Barras's concept of service innovation particularly within the context of web-based services. However, it should be noted that Barras did not claim his model was necessarily applicable to all aspects of the service sector and recognised that more research was necessary to explore its relevance. This paper is an attempt to consider the Reverse Product Cycle alongside more recent studies of e-Government and the relationship between technological and organisational change. It may be that applying any linear model of this relationship in whatever direction is too simplistic and that the subtleties of organisational type and the characteristics of individual technologies need to be taken more closely into account in future studies.

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