

IT Outsourcing in the Public Sector Local Government: Experiences of the management and selection of IT service providers

Michael Cox, Martyn Roberts and John Walton
University of Portsmouth Business School, UK

Michael.Cox@port.ac.uk

Martyn.Roberts@port.ac.uk

John.Walton@port.ac.uk

Abstract: This paper looks at issues in Information Technology (IT) outsourcing in public sector local government in the UK, to determine how successful they have been and to establish any best practice. This is important because, whilst outsourcing has become a significant issue in the restructuring of organisations and is increasingly used within both the private and public sectors, there has been a lack of research into IT outsourcing in the public sector and particularly within local government. This paper provides an in-depth study into how outsourcing is managed in local councils and how successful it has been; especially considering its sometimes controversial nature and the mixed press results it receives. This paper focuses in particular on an analysis of the risks of IT outsourcing and the management of the outsourcing contract. The research shows that a thorough risk assessment must be completed before an outsourcing contract is agreed. Local government tends to adopt a very cautious approach to outsourcing based on risk minimisation. Hidden costs are one of the greatest risks when outsourcing. Hidden costs occur in selection, managing the contract, and making changes to the contract, all of which can offset any cost savings identified at the start of the outsourcing contract. The research shows that local councils recognise the importance of the contract and that it has the largest single impact on the success or failure of the outsourcing agreement. Having a well written contract is necessary to minimise the risks posed by outsourcing. However, the local government bodies recognised that it is impossible to cover every detail in the contract, particularly where needs are fluctuating, and that an element of trust is required to manage the contract successfully. The research suggests that contracts need to be strict enough to motivate the provider but should be realistic and achievable so that they do not inhibit the development of a working relationship. The paper also addresses issues in the selection of outsourcing providers and more recent developments since the new UK government's austerity programme. The study concludes that, whilst councils recognise that both the contract and trust are important to ensure that outsourcing is successful, the culture of risk aversion in the public sector tends to lead to a 'play it safe' mentality resulting in an overemphasis on the contract. This can lead to a short-term focus that could make it difficult for the council and the provider to work together to meet long-term goals. The councils were generally skeptical of developing partnerships; however, the research reveals that councils who focused predominantly on the contract were less successful than those who developed partnerships with their providers. The authors therefore recommend that, in order to achieve greater success, councils should develop partnerships and focus on best value and long-term strategic goals when outsourcing IT.

Keywords: Information Technology (IT); Information Systems (IS); outsourcing; public sector; local government

1. Introduction

The use of outsourcing, although not a new phenomenon, has increased in recent years as firms seek to lower costs and increase efficiency in response to higher levels of global competition. Child (2005, p.179) describes outsourcing as "the contracting out of activities that need to be undertaken on a regular basis, which otherwise would be conducted within an organisation". Kern and Willcocks (2000, p.322) define IT outsourcing as "a decision taken by an organization to contract out or sell the organizations IT assets, people and/or activities to a 3rd party supplier, who in exchange provides and manages assets and services for monetary returns over an agreed time period". Outsourcing has become a significant issue in the restructuring of organisations and many commentators agree that it is currently "one of the fastest-growing" and most important activities in business (Burnes & Anastasiadis, 2003, p.355; Weinert & Meyer, 2005, p.1).

Outsourcing offers numerous advantages; however there is also evidence that outsourcing often fails. The potential benefits include cost savings, efficiency gains, improved flexibility, access to world-class expertise and focus on core competencies. However, outsourcing also poses numerous risks that must be managed in order for outsourcing to be successful (Kremic, 2006, p.467).

Outsourcing is identified in two categories; outsourcing of core value-chain operations and outsourcing of support activities. The core value-chain operation is the outsourcing of supply chain activities such as distribution, whereas outsourcing of support activities includes HRM and facilities

management (Child, 2005, p.181). Outsourcing initially involved the outsourcing of non-core activities to reduce costs and improve efficiency and had a relatively short-term focus. However, more recently outsourcing has been used more strategically as firms increasingly seek partnerships to become more efficient by focusing on areas where they can achieve competitive advantage (DiRomualdo & Gurbaxani, 1998, p.1). However, some theorists suggest that you should not outsource your core competency, whilst others argue that it can be difficult to define what is core and non-core. Alexander and Young (1996), cited by Que'lin and Duhamel (2003, p.648), distinguish between activities that "are critical to performance" but only support the core and those that actually provide competitive advantage.

This is a notable problem when outsourcing IT because, whilst some consider it a non-core activity, IT is becoming critical to service delivery. The fact that IT is complex and affects all activities within an organisation make it one of the most important activities outsourced (Weinert & Meyer, 2005, p.1). Lacity and Willcocks (1995, p.226) note that IT changes rapidly and switching costs to new technologies or suppliers can be high because IT demands high investment costs. They suggest this makes IT outsourcing unique compared to the outsourcing of other activities. This will have implications for how IT outsourcing is conducted and managed.

1.1 Outsourcing in the public sector

The public sector has followed the trend set by the private sector and IT outsourcing is now one of the most important outsourced activities that by "1996 had led to contracts worth £2 billion" (Lacity & Willcocks, 1997, p.85).

In the 1980's the government introduced Compulsory Competitive Tendering (CCT), this "involves government or firms using a competitive bidding process to help decide who should have the right to produce or deliver goods or services" within the public sector (Rimmer, 1994, p.79). This process was driven by "marketing and political trends" with the aim of making the public sector more competitive (Marco-Simó, et al, 2007, p.51). It was assumed that market-based competition would be able to provide improved efficiency and lower cost whereas public monopolies provided no incentives to improve performance (Besley & Ghatak, 2003). However, traditional outsourcing contracts in the public sector were often granted to the lowest priced bidder, which can lead to lower quality provision. Thus, the government updated CCT in 1998 to focus on best value rather than simply lowest cost, whether internally or externally (Butler, 2003).

However, whilst outsourcing has become one of the most important tools in public sector management, failures tend to attract greater publicity, due to political accountability, whereas successes often go unnoticed (Maughan, 2003). These failures have led to an increasing interest in how outsourcing is managed in local councils and to what extent it has been successful.

2. Literature review

Much of the literature available deals with IT outsourcing in general without specifically addressing cases within the public sector or local government. Indeed, Vilovsky (2008, p.337) notes that the available research is "limited and fragmented". De Looft (1996) finds this interesting since he shows that in the Netherlands 30% of IT outsourcing is accounted for by the public sector, a figure not too dissimilar to the UK. However, despite this, Marco-Simó et al (2007, p.52) note that outsourcing in the public sector "has not produced a level of research interest proportional to its economic importance". This has led to an increased interest in how outsourcing is managed within the public sector; especially considering the increasing use of IT outsourcing within the public sector the mixed press results it receives.

The lack of research in this area can be problematic for making comparisons. However, it does provide an opportunity to explore a gap in the literature and to discover if anything can be learnt from how outsourcing is managed in local councils. This is important because whilst the private and public sectors share some similarities they also have some notable differences. Vilovsky (2008, p.338) notes that the public and private sectors are divided both "ideologically and operationally". Both have similar values in terms of "responsiveness, honesty and accountability" but the public sector is not motivated primarily by financial performance. Thus, public sector managers may adopt a different mindset to outsourcing, based on goals and values other than cost efficiency, whilst being further constrained by political accountability. This could result in a more cautious approach to outsourcing

based on minimising risk. Burnes and Anastasiadis (2003, p.365), in their comparison of a police force and an insurance company, further highlight differences in supplier selection, contractual arrangements and in the management of the relationship between the public and private sectors. One major difference is that public agencies are legally required to outsource any activity that can be done cheaper by outside contractors, as long as they meet the minimum specifications (Burnes & Anastasiadis, 2003, p.359). The private sector, in contrast, has more choice over whether they outsource and to whom and can therefore do so more strategically and approach the best suppliers directly (Lin, et al, 2007, p.164).

Currie (1996, p.226), in a comparison of the experiences of IT outsourcing in the UK's private and public sectors, shows that IT outsourcing poses significant challenges to both and should not simply be seen as a "quick-fix" solution. Lacity and Willcocks (1997, p.106) investigated two case studies in the US public service. They have previously suggested that the UK has had "long standing problems" with outsourcing and that the results have often fallen short of expectations. In this article, they suggest that politicians often believe that outsourcing will automatically save money whereas in reality outsourcing either has failed or has yet to show any real benefits.

Frederick (1994), however, contends that CCT has been successful and has produced both cost savings and increased efficiency. Indeed, Maughan (2003) suggests that the public sector is better at managing outsourcing relationships than the private sector because they devote staff exclusively to managing the relationship whilst the private sector generally does not which can create a lack of focus and clarity. He also states that the public sector benefit from having clear guidelines and a lengthy procurement process, which allows for multiple tenders, imposed upon them by legislation. Vilovsky (2008, p.342) contends that public sector managers often find legislation and guidelines "a legal constraint rather than an aid" which may create inflexibility and lead to contracts being awarded to the lowest cost bidder rather than the best quality. Despite this, Burnes and Anastasiadis (2003, p.365) argue that the private sector could learn from the public sector's structured approach. They suggest that government guidelines can create a greater understanding of outsourcing requirements and may produce more stable relationships. This research explores these issues further.

3. Methodology

This research takes the form of a multiple case study. Creswell defines a case study as "a single, bounded entity, studied in detail, with a variety of methods, over an extended period" (Maylor & Blackmon, 2005, p.243). Marco-Simó et al (2007, p.59) have argued that we need more "real cases" before "we can generalise the findings". A case study approach was chosen because this type of research is useful when 'how' or 'why' questions are being asked (Saunders et al, 2007, p.139).

The case study allows an in-depth examination to develop an enhanced understanding of the subject area and develops areas for further research (Flyvbjerg, 2004, p.420). Commentators agree that this method allows for a greater understanding of complex issues and is more comprehensive than surveys, due to its ability to "come closer...to the complexity of real organisation setting" (Maylor & Blackmon, 2005, p.242). Yin (1984), cited by Gable (1994, p.113-115), believes that a single case study is useful in areas that are under-researched and require exploration, whereas multiple case studies are used to test for patterns and draw comparisons. The purpose of this research was to explore a complex issue in-depth and to identify some common trends rather than to present a generalised industry view. Indeed, Flyvbjerg (2004, p.420) argues that the case study is a reliable method in itself due to its ability to incorporate multiple data collection methods.

3.1 Case studies

The case studies are based on four local government councils in the south of the UK. The results of a more recent interview at a different local council are included towards the end of the article in order to update the thinking on the most recent developments.

3.2 Data collection methods

To answer the research questions semi-structured interviews were conducted at four local councils. The interviews were held with the heads of IT at the councils. The interviews were the primary data collection method and allowed the authors to explore the interviewees' experience and attitudes towards IT outsourcing. This paper presents a summary of the data collected.

4. Analysis of results

4.1 Summary of responses

Table 2 summarises the main issues as described by the four interviewees at the four councils.

Table 1: Description of the cases

Council	Description
A	Council A is a district council that serves a population of around 110,000 people. IT supports the council's everyday operations and is critical to business performance and service delivery. IT is one of the most important activities outsourced at this council. A budget report meeting in 2008 revealed that the contract for IT services is the second most expensive contract at the council, at over £700,000 per year. The ICT strategy at the council is not only to improve the efficiency and effectiveness of the service but also to increase its accessibility to all. The Council signed a 5-year contract with their service provider in 2005, worth £2.5 million. This contract was to provide the council with a full IT managed service that included desktops, servers, infrastructure and applications support.
B	Council B is a unitary authority that serves a population of around 200,000 people. Council B chose to outsource to one supplier in a 10-year contract. This contract included not only the provision of IT but also related services such as HR, payroll, Customer Service, local taxation and benefits, procurement and property services. The council sought one strategic partner to ensure greater integration between the councils services but also because greater cost reductions could be achieved by outsourcing many services to the same provider. The main reason that the council opted for a long-term agreement was because of the high investment needed at the start of the agreement. This meant that the council needed to allow sufficient time for the provider to recoup their investment costs.
C	Council C is a unitary authority that serves a population of 150,000. This council outsourced for seven years. The council outsourced its entire IT department. Services provided include procurement, technology refresh, network development and support, offsite server hosting support and offsite mainframe services, as well as application support and management, 24x7 services monitoring and helpdesk.
D	Council D is a district council that serves a population of 110,000. Council D do not outsource IT.

Table 2: Summary of responses

Council A	The council considered the loss of key skills, hidden costs, and security the main risks. Hidden costs occurred over interpreting the contract and when changes were needed. The provider also did not have all the necessary skills on-site and charged extra to bring them in. They also believe it is difficult not to become over-dependant.
Council B	The council argued that security and hidden costs are the only very important risks to consider. This is offset by writing a complete contract but admitted that hidden costs had occurred regardless. Loss of control was considered the third most important; this is offset by the retention of an in-house team tasked with monitoring the agreement.
Council C	The council considered hidden costs, loss of key skills, security and over-dependence important risks. The council should retain staff with the ability to monitor and evaluate the contract. Hidden costs occur when changes are required thus you need to write a complete contract but also develop good relations to make the provider more open to changes.
Council D	The council believes the greatest risk is knowledge management because you have no control over how the provider conducts activities. Thus, you should only transfer staff you do not need and retain skilled staff. Whilst everything else should be documented in the contract, hidden costs and security are still very important risks to consider. The council need to write a complete contract and develop trust because it can be difficult and costly to make subsequent changes to the contract.

The interviewees from the four councils were asked to rank the seven motivational criteria (7 being the most important, 1 the least). Table 3 and Figure 1 illustrate the responses.

Table 3: Interviewees ranking of main risks

	Interviewee A	Interviewee B	Interviewee C	Interviewee D	Aggregate Score
Loss of Control	2	5	3	1	11
Hidden Costs	5	6	7	7	25
Over-dependence	1	3	5	3	12
Security	6	7	4	6	23
Staff Morale	4	1	1	2	8
Loss of key skills	7	2	6	5	20
Inflexibility	3	4	2	4	13

The Risks of Outsourcing IT

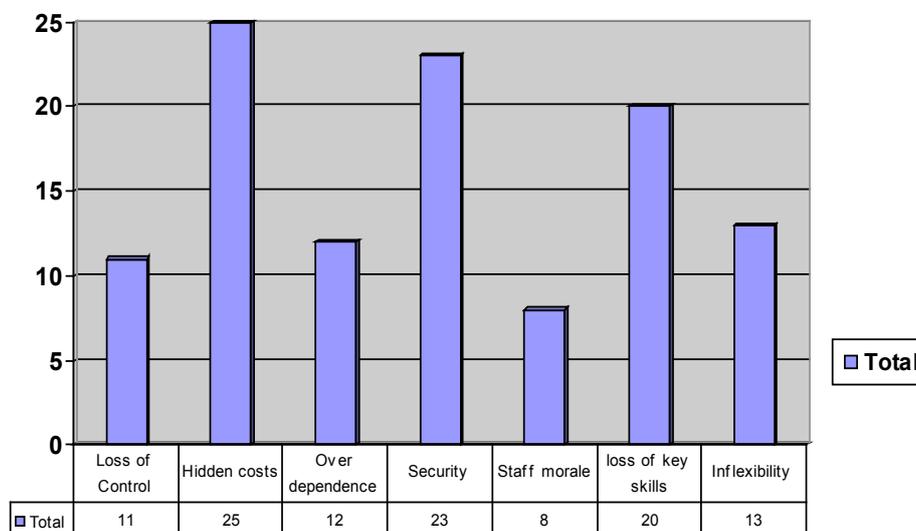


Figure 1: Summary of individual rankings

In Table 4 and Figure 2 the interviewees from the four councils were asked to state whether the motivations were: *Very Important, Important, Unimportant or Irrelevant* to their decision to outsource.

Table 4: Interviewees categorization of risk factors

	Interviewee A	Interviewee B	Interviewee C	Interviewee D
Loss of Control	Important	Important	Unimportant	Irrelevant
Hidden Costs	Very Important	Very Important	Important	Very Important
Over dependence	Important	Important	Important	Unimportant
Security	Very Important	Very Important	Important	Very Important
Staff Morale	Important	Unimportant	Unimportant	Unimportant
Loss of key skills	Very Important	Unimportant	Important	Important
Inflexibility	Important	Important	Unimportant	Important

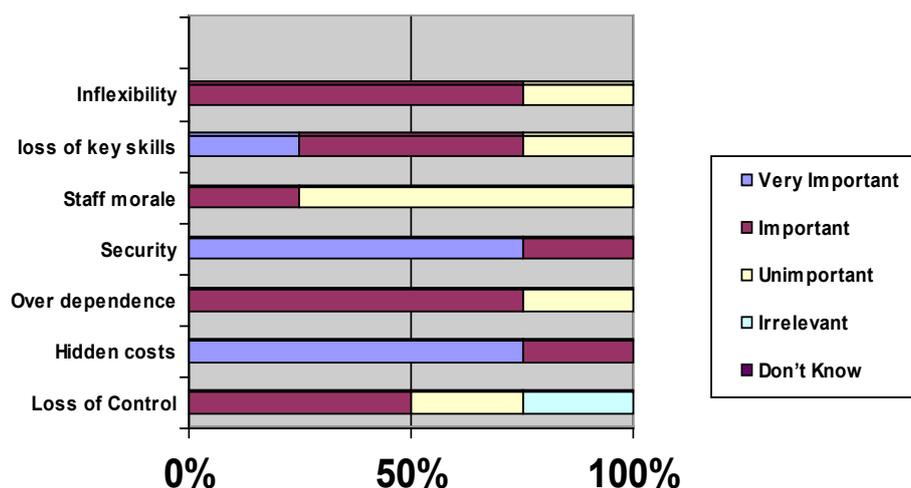


Figure 2: Importance of risk factors

4.2 Discussion

4.2.1 Hidden costs

Hidden costs were considered the most important risk of outsourcing IT and three of the four Interviewees considered it very important. Interviewees A and B both noted that hidden costs had occurred in their contract.

Hidden costs are the most important risk to consider because any costs that arise later may offset any savings from the agreement (Barthelemy, 2003a, p.93). The research has shown that councils should not underestimate the high costs incurred during selection and from managing the contract. Additionally, the provider will give you only what you ask for in the contract and will charge additional costs for anything unspecified. Therefore, the council need to understand every aspect of the service and the requirements before outsourcing and write a complete contract (Barthelemy, 2003a, p.93). However, as Interviewee A observes, writing a completely “fool proof” contract is difficult due to the fast changing nature of IT. Interviewees C and D argue that developing good relations maybe more important. Council A may have suffered hidden costs because they had focused too much on price. This suggests that a more balanced approach to outsourcing and the development of trust could reduce this risk.

4.2.2 Security

Security was the second most important reason and three of the four IT managers considered it very important. This is because councils deal with highly sensitive information, which they need to keep protected. Thus, councils need to be able to trust their provider, which could explain why councils require references.

4.2.3 Loss of key skills

The loss of key skills was considered the third most important risk to consider when outsourcing although one Interviewee considered it unimportant.

Burnes and Anastasiadis (2003, p.364) argue that public sector agencies retain less knowledge concerning the outsourced activity because they consider it a low-grade activity that needs only minimal management. Furthermore, Holzl, Reinstaller and Windrum (2006, p.1) argue that outsourcing could have a negative long-term impact on organisational innovation. However, whilst the Interviewees expected outsourcing to take less time to manage, three Interviewees considered the retention of key skills vital to manage and evaluate the outsourcing agreement, to focus on strategy and to develop new ideas. This also reduces their dependence on their provider and allows them to recommence IT in-house at the end of the contract or in the event of failure. Indeed, Council B only considered the loss of key skills unimportant because transferred staff continued to work on-site and the council retained key staff.

4.2.4 Inflexibility

The research has illustrated the difficulties of writing a flexible contract. Indeed, whilst Council C achieved flexibility, the others, including Interviewee D, argued that flexibility could only be gained at extra cost. The risk of inflexibility led Council A to opt for a 5-year contract and even Interviewee C is recommending a shorter agreement the next time his council outsource.

4.2.5 Over-dependence

Three Interviewees considered over-dependence an important risk although it was considered less important than the other risks. The interviews conclude that it is difficult not to become over-dependent because the provider needs full control of the servers. Thus, as Interviewee D argues, you need to fully commit to outsourcing to achieve the benefits. To reduce the risk of over-dependence the councils all retain in-house teams.

Similarly, only two Interviewees considered the loss of control important. This is because when you outsource IT you are passing the responsibility for running the service to the provider and therefore the councils were more concerned that the results were achieved rather than keeping control.

Interviewee B, however, did consider loss of control and over-dependence important. This is probably because Council B signed a long-term contract. These agreements can offer greater benefits in terms of cost savings, strategic support, and investment. However, as Willcocks and Currie (1997, p.107) observe, they could also contain higher risks in terms of over-dependence and inflexibility. This is why Interviewees A and C believed that long-term contracts were too risky.

4.2.6 Staff morale

Three out of the four managers classed this as unimportant. Thus, whilst Barthelemy (2003a, p.87) argued that you should not overlook personnel issues, the Interviewees did not consider this as important as the other risks. The councils believed staff morale was maintained through legislation that guarantees transferred staff the same terms and conditions.

4.3 Contract and management

This section assesses how local councils manage outsourcing to determine the importance of both the contract and trust to success.

4.3.1 Contract

The research supports Barthelemy's (2003a, p.90) conclusion that the contract is integral to set expectations and has the largest impact on the success or failure of the outsourcing agreement. The Interviewees all argued that it was difficult and costly to make subsequent changes to the contract and therefore you need to write a complete contract to minimise the risk. Indeed, even at Council B, which was billed as a 'strategic partnership', the contract was extensive. Interviewee D further notes that, whilst developing a partnership is the key to success, you will receive nothing more than is documented in the contract. A common conclusion drawn from this research is that unless the contract is black and white then hidden costs will occur over its interpretation.

The importance attached to the contract means that councils retain an in-house team and a contracts manager exclusively devoted to monitoring and evaluating the outsourcing agreement and managing the contract. The contracts include precise performance measures and numerous Service Level Agreements (SLA), which include financial penalties to motivate the provider to meet targets. Furthermore, councils retain the right to cancel the contract in the event of sustained service failures to prevent them from being locked into an unsuccessful agreement. Interviewee A notes that these measures can have a debilitating effect on the relationship but are necessary to keep the provider on track.

4.3.2 Trust

Despite writing detailed contracts, the interviews highlight the difficulties of writing a "full proof" contract due to the fast changing nature of IT and showed that hidden costs occurred regardless. Indeed, Interviewee B notes that writing a complete contract is one of the greatest challenges of outsourcing. Thus, as Trott (2008, p.235) suggests, trust maybe necessary to ensure the provider

remains flexible to changing needs because, as Interviewee A notes, it is very difficult to negotiate subsequent changes to the contract. However, the fact that only Council C achieved flexibility whilst the other two councils who outsourced IT reported hidden costs suggests that these councils focused too much on the contract rather than on developing trust.

However, whilst Maughan (2003) argues that the councils' hands on approach to managing the contract makes them better at managing outsourcing agreements, the interviewees acknowledged that over-relying on the contract would create tension and make it difficult for the council and provider to work together (Sabherwal, 1999, p.81). Although the councils recognise the need for financial penalties, they support Gareiss's (2002) conclusion that using penalties for every minor default would have a negative effect on the relationship. Interviewee A, for instance, noted that the council did not hold the provider to every contract detail if they were performing well overall. Thus, the interviews support Hart's (2008) conclusion that the contract should provide mutual benefit and targets should be fair and achievable to get the best performance.

The councils saw the benefits of creating a working relationship, facilitated by regular meetings, to improve service delivery and resolve any problems. Thus, whilst the contract is important and sets the expectations for the relationship, the interviews suggest that councils believe that trust is essential to put the contract into practice. This suggests that both trust and the contract are the "key to success" (Barthelemy, 2003b, p.539) although the exact balance will depend on what is outsourced and the context of the agreement.

4.3.3 Partnership model

The example of Council C shows that councils can be successful if they put the contract aside and develop a partnership with their provider based on high levels of trust. This is emphasised by the fact that they were the only council to achieve flexibility and subsequently won the partnership of the year award. This is supported by Interviewee D who, in his experience, found that the partnership model led to greater success and believes that the contract should be set aside after the first six months. Partnerships encourage the provider to be flexible and committed to the councils needs beyond the contract and allow both sides to work together to improve service delivery (Sun, Lin & Sun, 2002).

However, two of the three councils who outsourced argued that, whilst trust was important, the contract still formed the basis of the relationship. Interviewees A and B support Lacity and Hirschheim's (1993, p.259) conclusion that partnerships do not exist in outsourcing and believe the contract is the only "mechanism to ensure that expectations are realised". Council A signed a short-term contract and therefore may have focused on the contract because the pressure to meet short-term goals can inhibit the building of trust. However, the contract still took precedence at Council B who signed a long-term 'strategic partnership' with their provider. A council report noted that the contract was meant to come secondary to resolving problems through cooperation. The council had outsourced many services in a long-term agreement and therefore could easily become over-dependent without trust. DiRomualdo and Gurbaxani (1998, p.6) note that partnerships work better in long-term contracts because there "is more uncertainty about requirements". Similarly, as Council C shows, long-term agreements can generate higher levels of trust because relationships evolve over time. However, despite focusing on long-term goals, Interviewee B argued that after initial difficulties the relationship reverted back to a contractual based agreement. This supports a report by Nineveh Consulting (2007) that argues that most partnership agreements in the public sector are little more than "traditional client/contractor relationships". Indeed, the fact that both Interviewee A and Interviewee B were sceptical of partnerships because the provider and council have different drivers could support Head's (2005) findings that agreements are labeled partnerships "purely for political expediency".

This shows that local councils recognise the value of trust but still appear reluctant to put aside the contract and therefore adopt a more short-term focus. This could be because councils focus on minimising risk or because they lack experience in developing long-term relationships, which could make them more comfortable managing the contract. This overemphasis on the contract, however, could explain why Councils A and B both reported that hidden costs had occurred and found that it took longer than anticipated to manage the contract and deal with problems and were less successful than Council C whose partnership agreement appears to have proceeded more smoothly.

4.4 Selection

4.4.1 The Selection Process

The Interviews confirmed that councils are legally required to conduct a “rigorous and open selection process” (Burnes & Anastasiadis, 2003, p.362) and contracts over a certain size must go through the EU tender process. The open invite can lead to a high number of responses, which the councils reduce to a more manageable number by using pre-qualification questionnaires. The final shortlist of providers are then invited to give presentations, before the preferred provider is chosen.

The tender process is lengthy and detailed, ranging from 18 months to 3 years in this research. The open invite means that councils must evaluate and respond to all bids. This means councils must set clear requirements to enable companies to bid for the contract and make evaluation easier, which enables them to gain a more thorough understanding of the outsourcing requirements and make more informed decisions (Burnes & Anastasiadis, 2003, p.365). This structured process, as Interviewee A argues, can allow the council to achieve best value through competition and write “fool-proof” contracts to minimise risk.

However, the long tender process results in high costs to the council because of the time and energy needed to evaluate all bids and to keep the contract up-to-date. This, as Barthelemy (2003a, p.93) observes, is a very important hidden cost to consider and Interviewee D considers the process a waste of taxpayer money. Thus, whilst this process is necessary for transparency and fairness and can produce best value, Interviewees C and D do not believe the procurement process is beneficial to councils. Indeed, Interviewee D supports Burnes and Anastasiadis (2003, p.362) conclusion that the private sector has the advantage of being able to go directly to the best companies and can therefore conduct the process faster and cheaper. Thus, as Interviewee C argues, there should be an optimal time period for the process that would provide structure but avoid excessive costs. Council A may have preferred a structured process because they focused more on the contract and cost efficiency, whereas Council C and D may have found the process too rigid and inflexible, which could make it more difficult to select companies who can support the councils’ long-term goals.

4.4.2 Selection Criteria

Legislation stipulates that public sector agencies must make selection decisions based on best value rather than lowest cost (Butler, 2003). However, Burnes and Anastasiadis (2003, p.362) observe that local councils are legally obliged to outsource to the lowest cost bidder as long as they meet the minimum specifications for the contract.

Table 5 - Criteria for Selection Decision

	Interviewee A	Interviewee B	Interviewee C	Interviewee D
Capabilities	Yes	Yes	Yes	Yes
Price	Yes	Yes	Yes	Yes
Size of the company	No	No	No	Yes
Number of deals the provider has had	No	No	Yes	Yes

All the Interviewees considered price and capability important and sought to achieve best value (see Table 5). However, political accountability and budget constraints can lead to an overemphasis on price. For instance, although Interviewee A argued that bids were evaluated on a 60:40 quality to cost ratio, the research suggests they focused too much on price, which resulted in the provider cutting back in other areas and led to hidden costs. Similarly, Interviewee D argues that price is essential and forms 60% of the decision.

Indeed, even at Council B who focused on best value, a report stated that the most “economically advantageous” bid should be chosen. However, Council B also had to choose a provider who had expertise in a wide range of business functions. This research shows that councils try to achieve best

value although the need for cost efficiency can result in a short-term focus, whereas the private sector do not necessarily have to opt for lowest price and can focus more on strategy when outsourcing (Lin et al., 2007, p.164).

Table 5 also shows that the provider's size was only important to one council whilst the number of previous deals was important to only two. However, the interviewees noted that councils require references before they accept their provider. Council A chose a provider who had previously had a successful relationship with another council, Council B chose a provider who accounts for over 20% of Strategic Services Partnerships with local councils in the UK and Council C selected a provider with whom they had a long-term relationship. This allowed Council C to develop a successful partnership with their provider.

This approach allows councils to select companies who have previously had successful deals in the public sector and can therefore be certain of their capabilities, thus minimising the risk posed by outsourcing. However, whilst it could be argued that the need to re-tender at the end of the contract can inhibit the building of trust (Burnes & Anastasiadis, 2003, p.362); the requirement for references to gain future contracts could create greater commitment from the provider. This, however, may reduce the number of companies considered for a contract and make it difficult for firms to enter the market thus reducing the councils' ability to get the most cost-efficient deal.

5. Developments

In 2010 the UK formed a coalition government of Conservatives and Liberal Democrat parties. In their first budget (June 2010) a series of austerity measures were introduced in an attempt to reduce the accumulated budget deficit (The Cabinet Office, 2010). These included reductions in grants made to local government and this has understandably impacted on Information Systems and local council's views on outsourcing. The following discussion is a [limited] update on the situation following a recent (March 2012) interview with the IT manager at one of the local councils.

The council does not currently outsource its information services but the situation is under constant review. Although the claimed potential savings from outsourcing are always tempting, the IT Manager raised a number of concerns that irrespective of central government austerity measures still mean that that outsourcing is not necessarily a panacea.

5.1 Lack of Expertise

There is a fear factor that the outsource provider holds all the cards. By definition outsourcing is what the outsourcer does and they have a high level of expertise and experience in negotiating contracts. By contrast local councils only perform this occasionally and have little expertise. Hence local governments fear that they are negotiating from a position of disadvantage. Without incurring the expense of specialist legal advice, the councils are reluctant to enter into negotiations.

5.2 Minimum Contract Period

Many of the outsource providers will not enter agreements under 10 years. The IT manager felt that given political and environmental uncertainty that this was an excessive period of time for many councils to commit to a contract. The contract may not provide the flexibility that is needed as needs and the political environment changes.

5.3 Outsourcing – A Panacea?

The IT manager felt there were a number of down sides to outsourcing of IT:

Outsourcing doesn't remove all costs. There is still an overhead in managing the outsourcing contract.

Although there is potential for savings there are also potential risks – are the savings worth the risks?

There may be potential for further savings within local government without Outsourcing by implementing Lean policies and measures.

By outsourcing, although the IS provider may change; the systems and software provided may well be the same (for instance software such as Microsoft or SAP).

By outsourcing, services can be dispersed or fragmented which can, paradoxically, lead to a reduction in the quality of the service.

5.4 Shared Services

Many local authorities have moved to shared services in the last few years. Certainly IT managers across local councils in a region have formed forums and working groups to get together to discuss and collaborate on issues that have common themes, including outsourcing. They are proving successful in reducing the feeling of isolation felt by many of the IT managers. However, the IT manager was again keen to point out that they are not a panacea: The nature, culture and needs of different councils differ, making it difficult to form a consensus on common issues. Also that there is a danger of being forced to work at the pace of the slowest, with more go-ahead councils being held back by those less ambitious or more conservative in their outlook.

6. Conclusion

The research shows that a thorough risk assessment must be taken before you enter into outsourcing agreements. The local councils adopt a very cautious approach to outsourcing based on risk minimisation. The research supports Barthelemy (2003a, p.93) conclusion that hidden costs are one of the greatest risks when outsourcing. Hidden costs occur in selection, managing the contract, and making changes to the contract, all of which can offset any cost savings during the agreement. Indeed, flexibility can only be gained through outsourcing at extra cost to the council or through the development of trust.

Lacity and Hirschheim (1993, p.19) argue that companies need to retain key skills to allow them to effectively evaluate opportunities or move the activity back in-house. The councils, as Barthelemy (2003a, p.92) recommends, all retained an in-house IT team tasked with monitoring the contract, developing new ideas and focusing on strategy, which enables them to reduce the risk of over-dependence and loss of control. However, these risks were considered less important than the other risks because councils must not become over-dependent and must fully commit to outsourcing for it to be successful. Similarly, whilst Barthelemy (2003a, p.87) argues that you should not overlook personnel issues, councils do not consider staff morale to be an important risk when outsourcing.

The research shows that there are benefits to the structured selection process that local councils are required to follow. This allows for a more thorough understanding of the outsourcing requirements and results in more informed decisions. Thus, as Maughan (2003) argues, this allows for a "more carefully planned and managed process" and can make the public sector better at managing the outsourcing contract. However, the tender process is also time-consuming and very expensive for councils and providers. Thus, as Burnes and Anastasiadis (2003, p.364) comment, the private sector can conduct the process cheaper by approaching the best companies directly.

Barthelemy (2003a, p.89) argues that selection should not be based solely on cost but also on skill, expertise, flexibility, commitment and trust. The research shows that where the primary focus of selection was price, the results were not achieved. Indeed, as Hart (2008) notes, hidden costs are more likely to occur where councils focus too much on price during selection. However, despite this, contracts are awarded to those who make the lowest bid, as long as they meet the minimum specifications (Burnes & Anastasiadis, 2003, p.362). A report from Council B, for instance, noted that the most "economically advantageous" bid should be chosen. Despite this, the councils all reported to focus on best value and noted the importance of both price and capability. The use of references also allows councils to reduce the risks by selecting only those who have had successful agreements in the public sector. This can reduce the number of companies considered for a contract thus inhibiting the councils' ability to achieve best value but allows the council to be certain of the provider's capability. However, the need for best value and cost efficiency could result in a short-term focus and therefore, as Lin et al (2007, p.164) note, this could put councils at a disadvantage to the private sector who do not have to opt for lowest cost and can therefore focus more on long-term goals.

Data from a recent interview with a local government IT manager indicates that IT outsourcing is still being looked at as a way of managing IS, but despite recent political pressure to cut costs in local

government generally, IT managers are still very much aware of the dangers of outsourcing and that outsourcing is not always the panacea it is held out to be.

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The State of Affairs in Internet of Things Research

Nomusa Dlodlo, Thato Foko, Promise Mvelase, and Sizakele Mathaba
CSIR Meraka Institute, Pretoria, South Africa

ndlodlo@csir.co.za

tfoko@csir.co.za

pmvelase@csir.co.za

smathaba@csir.co.za

Abstract: With the Internet of Things (IoT) being a new research area, the work that is going on worldwide in this field is disjoint. The picture is not clear on who is doing what and where, thus making it difficult not only for newcomers into this field to define their space and also engage with potential collaboration partners, but also for the relatively established researchers as well to gain the necessary support in their work. There is a massive increase in the amount of data that is generated globally. This data is traditionally generated by a number of different autonomous devices. The IoT is about interfacing these autonomous devices to communicate without human intervention and generate integrated data. Intelligence is then required to process this integrated data and make it available to the humans for decision-making. If advantage is to be taken of IoT technologies, the need therefore arises to gain sufficient information that will be an impetus to further research on IoT and open the way to collaborations among the various researchers. This paper documents the international research that is going on in the area of IoT. It shows the main role players and the research territory they operate in. It also documents future research trends. The question that this research answers therefore is, "Who are the main role players in IoT research internationally, in which research space do they operate and how their work is shaping the future of IoT research?" The research is a qualitative study. A number of IoT conferences that have been held since 2008 when the first IoT conference was held in Zurich, Switzerland were identified. From the conference programs, contact details of individuals who had submitted papers or participated were identified. Emails were sent to the various stakeholders requesting information on their institutions, areas of application of IoT research and projects they were working on. Responses received also pointed to websites and publications which were then sampled to extract the relevant information. Preliminary results show that the European Union leads the pack in IoT research. Also, worldwide, institutions tend to specialise in particular aspects of IoT. Predominantly, it is the universities that are involved in IoT research as opposed to private sector institutions. IoT Research is a multidisciplinary field.

Keywords: internet of things, research, application domains, future internet

1. Introduction

The new concept of the Internet of Things (IoT) brings an opportunity for the creation of innovative applications that integrate the all too familiar traditional digital technologies. The IoT is about interfacing these autonomous devices to communicate without human intervention and generate integrated data. Intelligence is then required to process this integrated data and make it available to the humans for decision-making. In 2011, the world population reached 7 billion and the number of connected devices stood at 13 billion. By 2015 there will be over 3 times the amount of connected devices as people on the planet and 5 years later, there will be 50 billion connected devices for only 7.6 billion humans (Inspiring the internet of things, 2011). We are witnessing the return to the internet's original design. The very idea of the internet was to connect things to other things. Today there are already many things that communicate with other things, but historically they have used protocols other than the internet protocol (IP), and communication takes place over short distances, for example, in electronic locks and key cards. What is new about IoT is that communication can take place independent of location (Raunio, 2010). The original internet was about communications and then a means of delivering services. The next stage in this progression is a convergence of services with massively shared data. This is not possible without an advanced wireless and fixed infrastructure to allow access anywhere, anytime and creating an omnipresent fabric linking people and machine-to-machine communications (Future internet report, 2011).

Since IoT research is still in its infancy, there is limited literature available on the subject and so are the identities of the main role players. This research therefore documents international research that is going on in the area of IoT, the main role players and the future trends. The research raises awareness on opportunities for new players in the field to identify potential collaboration partners and map their research direction.

Sections 2 and 3 are on the IoT definition, application domain and technologies respectively. Section 4 is on the technologies of the internet of things. Section 5 of this paper reports on the methodology used to come up with the information. Section 6 reports on the main international role players in the IoT. Section 7 is on the potential IoT research areas as identified from the research that is currently going on. Section 8 is the discussion of the paper and Section 9 is the conclusion.

2. The internet of things

The Internet of Things (IoT) is what happens when everyday ordinary objects have inter-connected microchips inside them. These microchips help not only keep track of other objects, but many of these devices sense their surrounding and report it to other machines as well as to the humans. Also called M2M, standing for Machine to Machine, Machine to Man, Man to Machine or Machine to Mobile, the IoT intelligently connects humans, devices and systems, (Internet of Things in 2020, 2008). Analysts describe two distinct modes of communication in the IoT: thing to person and thing-to-thing communication (Raunio, 2005). Thing-to-person and person-to-thing communications encompass a number of technologies and applications, wherein people interact with things and vice versa, including remote access to objects by humans, and objects that continuously report their status, whereabouts and sensor data. Thing-to-thing communications encompasses technologies and applications wherein everyday objects and infrastructure interact with the human. Objects can monitor other objects, take corrective actions and notify or prompt humans as required.

The following are examples on applications of IoT in real life. The emergence of applications of sensor networks has room for adoption by law enforcement, military, border patrol, customs, etc. Vibration sensors distributed along national borders form an effective virtual fence. From real time monitoring of water quality in the ocean through sensors connected to a buoy that sends information via the General Packet Radio Services (GPRS) network, to the monitoring of goods being shipped around the world, and smart power grids that create conditions for more rational production planning and consumption can all be achieved via microchips implanted in objects that communicate with each other. Retailers tag individual objects using radio frequency identifiers (RFID) to solve many problems all at once: accurate inventorying, loss control and the ability to support un-attended walk-through point-of-sale terminals. Innovation in logistics allows improving efficiency of processes. The warehouse becomes completely automatic with items being checked in and out and orders automatically passed to suppliers. Items in transit make intelligent decisions on routing based on information received via readers or positioning systems. Utility meters rely on machine-to-machine communications, eliminating the need for a human meter reader and allow fully-automated billing. Weather forecasting infrastructure collaborates with in-ground sensors and irrigation-control software. The irrigation system engages, based on intelligent decisions involving the level of moisture in the soil and the likelihood of precipitation. Roadside sensors detect the flow of cars that have RFID-based toll collection tags and provide traffic reports. A variety of things can report their location to owners including keys, wallets, eyeglasses, jewellery and tools. Some applications related to the IoT aren't new: toll collection tags, security access key cards, devices to track stolen cars and various types of identity tags for retail goods and livestock. Other monitoring and tracking systems have more business uses such as solving or averting problems like sending a cell-phone alert to drivers that traffic is backed up at a particular exit ramp, and increasing efficiencies such as enabling a utility to remotely switch off an electric meter in a just-vacated apartment.

The IoT in 2020: roadmap for the future (2008) defines the IoT as “things having identities and virtual personalities, operating in smart spaces using intelligent interfaces to connect and communicate within social, environmental and user contexts”.

CASAGRAS defines the IoT as (Casagras, 2011): “A global network infrastructure, linking physical and virtual objects through the exploitation of data capture and communication capabilities. This infrastructure includes existing and evolving Internet and network developments. It will offer specific object-identification, sensor and connection capability as the basis for development of independent federated services and applications. These will be characterised by a high degree of autonomous data capture, event transfer, network connectivity and interoperability”.

Semantically, the IoT means “A world-wide network of interconnected objects, uniquely addressable, based on standard communication protocols” (Internet of Things in 2020, 2008) .

3. The internet of things application domains

The IoT can be applied in a whole range of domains as follows (Vision and challenges for realising the IoT, 2010 and Dlodlo, 2011):

3.1 Medical technology / health

The IoT has many applications in the health sector. These may include wearable staff support systems to locate both doctor and patient in a hospital at any point in time. It may also include IoT-based knowledge systems to detect adverse reaction to drugs in patients. The combination of sensors, Wi-Fi, etc come handy in the monitoring of vital functions of the body such as temperature, blood pressure, heart rate, cholesterol levels and to stimulate the heart muscle in case of a heart attack, etc. Implantable wireless identifiers can be adopted to store health records of people with chronic illnesses. IoT applications have an enormous impact on independent living and support for aging population by detecting daily living and support using wearable and ambient sensors and monitoring chronic disease. Things can send out regular alerts, e.g. the remote monitoring of patients with health problems such as heart disease, sugar levels, blood pressure. The AIRE project of the University of Murcia in Spain designs and develops an IoT platform to support remote monitoring, detect and predict anomalies in patients with breathing problems. The same institution is working on an IoT-based personal device for diabetes therapy management in ambient-assisted living (AIRE, 2011 and AIRE, 2012). Motorola's project PERSONA is a platform to enable support in daily life activities such as risk detection in mobility (Schaller, 2008). A number of institutions from Germany, Italy and Austria are collaborating on a wearable staff support for hospital wards (Adamer, 2008).

3.2 Retail, logistics and supply chain management

Implementing the IoT in retail, logistics and supply chain management has its own advantages. Smart shelves can track the present items in real-time. Stocks can be monitored through Radio Frequency Identification (RFID) tags to alert the shop owner on when to make new orders. Fast payment solutions can be effected through tag reading check-out points. For pharmaceutical products, security and safety is of utmost importance. Tracking them through the supply chain and monitoring their status with sensors ensures a quality product to the end-user. Drugs require certain storage conditions, hence monitoring their condition in transit and on the shelves are of vital importance. IoT offers the opportunity to trace food and ingredients across the supply chain, so that recalls can be issued when quality problems arise. Researchers at the TU Dortmund and the Fraunhofer Institute for Material Flow and Logistics are working on a simulator for a large-scale baggage-handling system in which routing is controlled by a multi-agent system within an existing discrete event simulation model (Roidl, 2008). Spatial temperature deviations occur regularly during transportation of fresh food products. The University of Bremen is working on intelligent containers that calculate the shelf-life of food in transit as a function of the temperature history and sends warning messages via SMS when the shelf life drops below a warning threshold (Hiebel, 2008). Fudan University in China is researching on food traceability. A cloud computing centre in Shanghai enables tracing food across a reconstructed supply chain so that recalls can be issued when quality problems arise (Getting technical over food traceability, 2011). The SunSPOT system at the University of Murcia in Spain monitors temperature, humidity and light of goods in transit through sensors. This is to ensure freshness and suitability for consumption (Castro, 2011). German universities use an RFID-based active sensor data logger to monitor the temperature of sensitive goods of high value in logistics (Active sensor data logger, 2012). Researchers at the Hasso-Plattner Institute are working on RFID as a basis for anti-counterfeiting by providing enhancements to existing business processes through the usage of Electronic Product Codes for identification (Integration of RFID technology in enterprise platforms, 2012)

3.3 Transport

The IoT offers a number of solutions in transport sector. Toll systems, screening of passengers and goods on aeroplanes to meet security requirements, monitoring traffic jams, and automated tracking of passengers and luggage are some of the application areas for IoT in transport. Applications in the automotive industry include the use of 'smart things' to monitor and report everything from pressure in tyres to the proximity of other vehicles. RFID technologies provide real-time data in the manufacturing and assembly of automobiles. Mobile users in vehicles are now able to communicate to other road users. There are applications to teach safe and comfortable driving by sensing the driver's behaviour

and comparing it with the sensed behaviours of other motorists on the road. The aviation industry is threatened by the problem of inappropriate parts. Safety and security of the service can be achieved by protecting them from counterfeiting through RFID tags with authentication of digital signatures on the real product and wireless monitoring of parts with intelligent sensing devices. German researchers are working on car-to-car and car-to-infrastructure communication (C2X communications) to reduce road accidents and fatalities. The 30 MHz spectrum is dedicated to safety-related C2X communications (Zhang, 2008). Adaptive speed devices obtain information through GPS-enabled smart phones and calculate the driver's speed (Goralczyk, 2008). The Computer Science Department at the Waseda University in Japan are working on an application that teaches safe and comfortable driving and motivates users to change their driving behaviour by comparing with other users who drive on the same road (Kimura 2010).

3.4 Insurance

In car insurance, electronic recorders are placed in cars to record speed, acceleration and communicate the information to the insurer to assess the risk. GPS-tracking devices are used to fight car theft. Active loss prevention in transportation can be avoided through indicators and sensor-telematic devices. Early detection of hazards through sensors prevents water and fire damage. The ilab which is part of the Autoidlabs in Zurich is working on IoT applications related to insurance (Prevention within household insurance, 2012). The mobilier emergency application allows customers to contact their insurer via their smart phone. E-bikes allow for continuous operation of GPS-based tracking devices. This tracking reduces bicycle theft and improves the safety of cyclists. Water claims caused by outdated or rusted pipes pose a problem. Early detection is the key in the prevention of water damages and related claims. Various sensors are able to detect small water leaks in rooms. SMS is sent to alert residents and automatic valves close the main water pipe.

3.5 Energy

The Bits to Energy Lab, a joint research initiative of the ETH Zurich and the University of St. Gallen in Switzerland, through its Amphiro project have developed a smart water meter that provides feedback on water consumption directly at individual faucets or shower heads. The device captures flow rate and temperature and derives the amount of water extracted, energy used and carbon dioxide emitted (The Bits to Energy Lab, 2012). The information is displayed on the basin or shower head. Through combining a smart meter with a mobile phone application, the consumption transparency is increased. Researchers at the Swedish Institute of Computer Science are working on enhancing applications to improve user awareness of energy usage. User Interfaces allow users better control over their usage (Karlgen, 2008).

3.6 Information security

The advanced research on information security and privacy project (ARES) which is funded by the Spanish Ministry of Science seeks to bring security to the information society while preserving individual rights. It focuses on three intertwined application scenarios, that is, ubiquitous computing with emphasis on wireless sensor networks and RFID, protection of critical information infrastructures and secure electronic commerce and digital content distribution, while tackling different tactical challenges in the areas of cryptology, smart cards, personal identification and biometrics, access control and authentication, network security and trust generation (ARES, 2012). The institute of Information Systems at the Humboldt-Universität zu Berlin is working on SHARDIS – a privacy-enhanced peer-to-peer (P2P) discovery service from RFID-based production information. The idea of SHARDIS is to enhance confidentiality of the client's query against profiling by adversaries (Aletheia, 2012).

3.7 Home automation

As cheap wireless applications become abundant, the range of applications broadens. For example, smart metering is becoming popular for measuring energy consumption and transmitting the information to the energy provider. Sensors for temperature and humidity provide the data to automatically adjust comfort levels in a room. Researchers from the Department of Information and Communication Engineering at the University of Murcia in Spain are working on a home automation system that uses several technologies for connecting with in-house devices and an IP-based network for connecting the main home automation module with the rest of the managing and control components. The main features of the system are: a number of appliances that can be controlled, a variety of in-home

networks, centralised control at a home automation module, in-home management through intuitive touch-screens, fault-tolerant design through database replication, value-added services in local and remote gateways, remote programming of automation module and security services through several possible alarm receivers connected by several WAN technologies (Zamora-Izquierdo, 2011).

3.8 Environment monitoring

Wireless devices increasingly used in green-related applications and environmental conservation are a promising market in the future. Remote monitoring of forest fires, possibilities of earthquakes, potential floods and pollution reduce environmental risks. The wireless industry offers the opportunity to monitor petroleum personnel in critical situations, the tracking of containers and the detection of gas and oil leaks as a way of reducing the risk of accidents. The IBM Research Lab is working on projects centred around the smart planet using mobile enterprise systems. The IoT systems introduce smarter transportation and smarter buildings that reduce energy consumption and greenhouse emissions (Smart Planet, 2012). Scientists from the Urban and Civil Engineering Department at Ibaraki University and Fukuyama Consultants in Japan are working in wireless sensor integrated circuit tags to collect and visualise ground environmental information through microscopic vibration and tilt change of ground. This information is helpful for the prevention of disasters (Saitou, 2010).

3.9 Manufacturing

By linking items with embedded smart devices or through unique identifiers that can interact with an intelligent supporting network infrastructure, production processes can be optimised. The iPack Centre is a VINNOVA Centre of excellence established at KTH and funded jointly by VINNOVA, KTH and industrial partners. The centre is a multidisciplinary research platform that establishes collaborations between Swedish forest products industry, electronic industry and bio-medical industry in the area of intelligent paper and packaging for biomedical applications. The centre develops core technologies for heterogeneous integration of biomedical sensors, energy supplies, computing and wireless communications on fibre-based packaging and paper boards, for innovative products such as smart bio-paper, intelligent pharmaceutical packaging and storage, intelligent patient monitoring devices. The research explores multi-disciplinary innovations encompassing self-powered, ultra low-cost wireless links, paper-based bio-medical sensors, printed energy cells and interactive paper functions, low-cost manufacturing and integration technologies as well as manufacturability aspects (iPack VNN Excellence Centre, 2012)

3.10 Agriculture

During outbreak of disease, real-time detection of the movement of animals through RFID tags becomes handy. To improve the efficiency of agricultural production, agricultural mechanisation is a key measure. The Chinese have developed an intelligent scheduling platform for agricultural machinery working with integrated ICT such as the internet, mobile phone, fixed phone, satellite navigation systems, cloud computing to implement the guidance and service of administration departments to agricultural mechanisation production, promote the restricted flow of machinery countrywide and improve its utilisation. The platform commands and dispatches farm machines, executes tillage, cultivation and harvest according to factors such as crop maturity time, weather, farm machine distribution, etc. It can realise functions including inquiry of farm machine positions, tract review, information reception and release, remote failure diagnosis, and measuring farmland area and estimation of crop yields (Zhiguo, 2011).

3.11 Education

IoT can enable interaction with physical spaces for learning purposes or communication. Researchers from the Department of Computer Science at the University of Waseda in Japan are working on an augmented calligraphy system that aims at supporting a calligraphy learner's self-training process by giving feedback. The system monitors the learner's posture by a web camera and notifies them if the posture moves into a bad shape. The system also supports a grading feature so that the learner can improve calligraphy writing skill. The web camera captures the images written on paper and their shape is recognised with OpenCV library (Shichinohe, 2010).

3.12 Telecommunications

The IoT creates the possibility of merging different technologies such as Global System for Mobile Communications (GSM), Near-Field Communications (NFC), Bluetooth, Global Positioning Systems (GPS), sensor networks, etc to create new services. The border between IoT and telecommunications blurs in the long term.

4. Technologies of the internet of things

A number of technologies can be identified by analysing a wide range of literature including (Inspiring the internet of things, 2011):

4.1 RFID

Radio-frequency identification (RFID) uses radio waves to identify items. In contrast to bar codes, RFID tags can be read away from the line of sight. They track items in real-time to yield important information about their location and status. Early applications of RFID include automatic highway toll collection, keeping track of entire inventory, supply-chain management for large retailers, prevention of counterfeiting in pharmaceuticals, and for patient monitoring in e-health. RFID tags are being implanted under the skin for medical purposes, e-government applications such as in drivers' licences and passports and RFID-enabled phones are some of the applications.

4.2 Sensor networks

To detect changes in the physical status of things is also essential for recording changes in the environment. In this regard, sensors play a pivotal role in bridging the gap between physical and virtual worlds, and enabling things to respond to changes in their physical environment, generating information and raising awareness about the context. Sensor networks need not be connected to the Internet and often reside in remote sites, vehicles and buildings having no Internet connection.

4.3 Microcontrollers

Microcontrollers are computer chips that are designed to be embedded into objects. Embedded intelligence in things distributes processing power in the network, and empowers things and devices in the network to take independent decisions.

4.4 Protocols

Machine-to-machine interfaces and protocols of electronic communication set the rules of engagement for two or more nodes of a network. Internet Protocol (IP) has become the standard for all data communication and it is therefore easy to move things over the Internet. Examples of protocols that can be used in low-power radio for communication are: Link Layer, ISA 100A, Wireless HART, ZigBee and IPv6. The Internet protocol for lower-power radio IPv6 plays a big role in the IoT. The advantage of IPv6 is that it meets the challenges of different existing systems having to work together. Because this interoperability is possible, the system of objects connected via the Internet can develop the same way that the current Internet developed. The version of IP currently in use, IPv4, supports only 4.3 billion unique addresses- a fraction of what is required to assign a name and location to everyone and everything.

4.5 Biometrics

Biometrics enables technology to recognise people and other living things, rather than inanimate objects. Connected everyday objects could recognise authorised users by means of fingerprint, voice print, iris scan or other biometric technology.

4.6 Machine vision

Machine vision can be a channel for delivering the same type of information that RFIDs enable. Machine vision is an approach that can monitor objects having no on-board sensors, controllers or wireless interfaces. For example, cameras on typical cell phones can capture images of objects; using image-processing algorithms, distant servers can identify such objects and report information about them. Smart components are able to execute different sets of actions, according to their surroundings and the tasks they are designed for. For instance, devices are able to direct their transport, adapt to

their respective environments, self configure, self-maintain, self-repair and eventually even play an active role in their disposal.

4.7 Actuators

Actuators detect an incoming signal and respond by changing something in the environment. Actuators such as motors, pneumatics and hydraulics can move objects and pump fluids. A relay, for example, is an actuator that toggles a mechanical switch, and can thus cause a good number of responses to occur such as enabling illumination, heating system, audible alarm and so on.

4.8 Location technologies

Location technology helps people and machines find things and determines their physical whereabouts. Sensors play a role, but that approach does not satisfy practical needs for geolocation resulting in the rise of wireless approaches including GPS and cellular towers. Radar, lidar and sonar can detect relative location of things, depending on their electromagnetic, optical and acoustic properties. Some things transmit their own radio, light and/or sound in order to disclose their whereabouts to people and machines. In the automatic identification of tagged products in order to quickly look up information or initiate a specific action, using bar codes for linking real-world objects to virtual information has a number of drawbacks when compared to an RFID-enabled feature with corresponding mobile RFID readers, such as Near Field Communication(NFC)-enabled mobile phones. Near Field Communication is a short-range wireless connectivity standard that enables communication between devices when they are brought within a few centimetres of each other through magnetic induction.

4.9 Bar codes

A bar code is an optical representation of machine-readable data and can be seen on the majority of products that are on sale in the retail industry to speed up the checkout process. These linear symbologies or so-called one-dimensional (1D) barcodes represent data in vertical parallel lines with varying space and line width. A lesser well-known two-dimensional (2D) barcode or matrix code is also an optical representation resembling something like a crossword puzzle of even more machine-readable data and can normally be seen on larger packaging containers to assist with warehouse logistics and quality control. Examples of matrix codes include QR Code, Data Matrix code and Semacode. QR Code is derived from Quick Response as the creator intended to allow its contents to be decoded at high speed. A Data Matrix code is made up of a two-dimensional matrix code consisting of black and white square modules arranged in either a square or rectangular pattern. The information to be encoded can be text or raw data. The code can be read quickly by a scanner which allows the media to be tracked, e.g., on a parcel. Semacode is machine-readable ISO/IEC 16022 data matrix symbols which encode URLs. It is primarily aimed at being used with cellular phones which have built-in cameras. A URL can be converted into a type of barcode resembling a crossword puzzle, which is called a "tag". Tags can be quickly captured with a mobile phone's camera and decoded with a reader application to obtain a web site address. This address can then be accessed via the phone's browser.

4.10 Ambient technologies

Ambient technologies refer to electronic environments that are sensitive and responsive to the presence of people. In an ambient intelligence world, devices work in concert to support people in carrying out their everyday life activities in easy, natural way using information and intelligence that is hidden

in the network connecting these devices. The ambient intelligence paradigm builds upon pervasive computing, ubiquitous computing, profiling practices and human-centric computer interaction design. It is characterised by systems that are:

- ❖ Embedded: many networked devices are integrated into the environment
- ❖ Context-aware: these devices can recognise you and your situational context
- ❖ Personalised: they can be tailored to your needs
- ❖ Adaptive: they can change in response to you
- ❖ Anticipatory: they can anticipate your desires without conscious mediation

5. Methodology

5.1 Purpose of research

The aim of this research was to document the international IoT research trends and landscape. The questions that this research asks are:

- Who are the main role players in IoT research internationally?
- In what research space does each of the role players operate?
- What patterns and trends are emerging in IoT research?
- How is the work of the role players shaping the future of IoT research?

5.2 Data collection

This research constitutes a qualitative study. Qualitative studies base their accounts on qualitative information, i.e., words, sentences and narratives (Blumberg, et.al, 2008). E-mails were sent to the various stakeholders involved in IoT research requesting information on their institutions, areas of application of IoT research and a brief overview of the projects they were working on. The responses received pointed to organisation websites and publications in most cases and these were accessed to extract the relevant information. These responses were captured as country specific IoT research trends to show the main actors in the field. The answers to these questions formed the underlying base to a literature survey and document analysis. The literature search was also conducted to fill in the gaps in the identified landscape and trends. Publications were downloaded which gave an indication of what research was going on in some of the institutions where there were no respondents.

5.3 Profile of respondents

The researchers identified a number of IoT conferences that have been held since 2008 when the first internet of things conference was held. These conferences were:

- The First International Conference, IOT 2008, Zurich, Switzerland, March 26-28, 2008
- The Internet of Things Europe 2009: Emerging technologies for the Future, Sofitel, Brussels Europe Hotel, May 7-8, 2009
- The 2nd Annual Internet of Things Europe 2010: A roadmap for Europe, Crowne Plaza Brussels – Le Palace, June 1-2, 2010
- RFID Systech 2010, University Castilla-La mancha, Ciudad, Spain, June 15-16, 2010
- Internet of Things 2010 Conference, Tokyo, Japan, November 29-December 1, 2010
- The 3rd Annual Internet of Things Europe Conference, Central Brussels, June 28-29, 2011,
- Internet of Things Conference, China 2011, Shanghai World Financial Centre, June 16-17, 2011

From the conference programs, names of individuals who had submitted papers at these conferences were identified. An internet search yielded their contact details. Of the 350 emails sent out, 37 responses were received from 12 countries. These countries include Spain, Germany, Switzerland, USA, Greece, United Kingdom, Taiwan, Brazil, China, Italy, France and Sweden. The institutions that are active participants are given in the analysis in Section 5.

5.4 Analysis

The information collected was classified according to country, domain of application, institution involved, research conducted by the institution and the various applications of the research work. Examples of domains of application would be location and tracking, education, security, ambient assisted living, intelligent transport, smart homes and planets, vehicular communications, retail and logistics, health, business, regulatory, legal, energy and insurance. Examples of applications of the research would be monitoring forest fires, locating goods in transit, remote monitoring of a patient's health, for example.

5.5 Study protocol

The development of a study protocol enabled the study to improve and achieve reliability.

Purpose	Study issues	Effects
Identify respondents	The respondents should be individuals and organisations who are active in the field of IoT research. IoT conferences were selected as sources of identification of such individuals and organisations, since participating in such conferences is an indicator of involvement in IoT research	The study targets individuals and organisations that are already involved in IoT research
Identify role of researcher	The role of the research is to identify respondents, solicit information through e-mail and conduct a literature survey.	The researcher is a person who is involved in IoT research. This is because they are in a better position to understand the field and give a proper analysis of concepts
Ensure optimum response from individuals and organisations is achieved	Effort is made to obtain an optimum response in terms of numbers of respondents by making follow-ups to requests for information where necessary.	The respondents' responses are recorded and analysed.
Ensure a comprehensive literature survey to identify trends and patterns is conducted	Ensuring a comprehensive literature survey leads to the production of a comprehensive analysis of trends and patterns	A technical report on literature is produced and analyses given

6. Role players in the internet of things

The preliminary results show Spain, Germany, Switzerland and Japan as the leading role players in the IoT industry (Dlodlo, et.al., 2011). Other countries are Austria, Czech Republic, USA, France, Taiwan, Iran, Denmark, United Kingdom, Finland, Netherlands, China, Brazil, Sweden, Italy, Greece, Korea and Norway as players to a lesser extent. Overall, Europe is the leading continent and supports IoT research through European Union Framework funding for consortia.

Spanish institutions are involved in wireless sensor systems for early forest fire detection, RFID transmitters to locate and trace personal assets in indoor and industrial processes and inventory control, NFC to enable interaction with physical spaces for learning and communication, human body monitoring using sensor fusion and neuro-imaging and home automation systems for controlling in-house devices. The main role players in the Spanish IoT space are the University of Zaragoza, Escuela Technica Superior de Ingenieria Informatica, University of Girona, Polytechnic University of Cartagena, Universidad de Castilla la mancha, University of Diesto, University of Malaga and the University of Murcia.

German institutions are working on RFID sensor data loggers to monitor the temperature of sensitive goods in logistics and handling of blood products in hospitals, C2X communications to reduce road accidents, sensors for environmental and user condition monitoring, wearable staff support systems for hospital rounds and middleware for facility management applications. The main role players in the German IoT space are the Hasso-Plattner Institute, University of Applied Sciences-Offenburg, Friederich-Alexander University of Erlangen-Nuremberg, University of Applied Science Bonn-Rhein, Fraunhofer Centre for Intelligent objects, Fraunhofer Centre for Integrated Circuits, Fraunhofer Institute for Material Flow and Logistics, University of Stuttgart, Technische University of Berlin, University of Bremen, Motorola, University of Bremen, Humboldt University zu Berlin, Technische University of Dresden, University of Karlsruhe, Hanover University, TU Munchen institute, SAP Research, Otto-von-Guencke University, Fraunhofer Geselleschaft, Technische University Darmstadt, Deutsche Telekom Lab and the Technische University Braunschweig.

Researchers in Switzerland are working on low-cost RFID tags for anti-counterfeiting, integration of shop-floor devices with enterprise systems, remote product authentication using NFC-enabled mobile phones, object recognition through visual features, global geometry and GPS location, sensor-based issuing policy on product quality in the perishable supply chain, legal aspects of IoT such as governance, security and privacy, emotive environments, smart meters in energy conservation, mobile systems for insurance claims and communications, and web connectivity for low-power

resource-constrained devices. The main role players are ETH Zurich, SAP AG St. Gallen, University of St. Gallen, Swiss Federal Institute of Technology, Zurich Research Laboratory and IBM Research GmbH.

Researchers in Japan are working on intelligent vehicular communication systems that collect and analyse data from users and calculate optimised driving on the road, wireless sensor integrated circuit tags to collect and visualise ground environment information through microscopic vibration and tilt change of ground, augmented calligraphy system that supports a calligraphy learner's self training process by giving feedback, and wearable computing environment for location services. The main role players are Waseda University, Ibaraki University, Tokyo Denki University, University of Tokyo and Keio University.

French researchers are working on a large scale EPC global network in which only one ONS root will exist in Europe and will be managed on a shared basis, security in vehicular networks, systems to track patients, medical personnel, drugs and equipment and a smart planet using mobile enterprise systems. The main role players are GSI France, France Telecom Group, Telecom ParisTech, AFNIC, RFID European lab.

Researchers in the USA are working on efficient cryptographic techniques to speed up integrity verification and detection of integrity corruptions in vehicular networks and business policies and government policies that shape the IoT. Researchers in the UK are working on sensor-based systems for monitoring workers exposure to vibration in order to reduce incidents of "vibration white finger" at construction sites, smart cities, ambient intelligent systems in speech recognition and natural language processing. Norwegian researchers are working on wireless smart applications in automotives, aeronautics, telecoms, medicine and logistics, RFID technologies for ambient systems, vehicle identification systems and embedded systems for electric vehicles. One of the main Norwegian role players in IoT is SINTEF.

Institutions tend to specialise in a particular aspect of IoT. The following are just a sampled example from a large range of institutions. Hitachi Europe specialises on smart cities, ETH Zurich's institute of pervasive computing specialises in smart objects. The IBM Austin research lab is working on the smart planet, while the Centre for Intelligent Objects at the Fraunhofer Institute is working on intelligent objects. In the area of logistics and production, the main role players are the Fraunhofer Institute for Material Flow and Logistics in Germany, the Group for the Automation of Production and Logistics (AUTOLOG) at the University of Castilla-la Mancha in Spain and the University of Bremen. The main role players in IoT in energy are the Escola Polytechnica University of Sao Paulo, with SAP Germany and the Department of Engineering at the University of Padova in Italy working on smart grids and energy-efficient buildings. In the area of e-health the Signals Processing and Biomedical Research Group at the University of Granada is working on human body monitoring, while the Intelligent Systems and Telematic Engineering Group at the University of Marcia in Spain is working on remote monitoring of patients. For IoT in security is the Institute for Information Systems in Humboldt University in Germany, the Network, Information and Computer Security Lab at the University of Malaga in Spain, the Department of Information and Communication System Engineering: information security at the University of Aegen in Greece and the Hasso-Plattner Institute of IT Systems Engineering in Germany. The University of Zurich Switzerland specialises in the legal aspects of IoT such as security governance and privacy.

The EU Framework has/and is still funding a number of projects in the area of IoT (EU framework projects, 2011). These projects are run by consortia of EU countries. The cooperating objects network of excellence (CONET) consists of 12 members. Cooperating objects consist of embedded computing devices equipped with communication as well as sensing or actuation capabilities that are able to cooperate and organise themselves autonomously into networks to achieve a common task. The ability to communicate and interact with other objects and/or the environment is a major prerequisite. These devices interact with their environment either by monitoring it (sensors) or by changing it (actuators), process the data and communicate to others.

The SOCRADES integrated project creates new methodologies, technologies and tools for the modelling, design, implementation and operation of networked systems made up of smarter embedded devices. Achieving enhanced system intelligence by co-operation of smart embedded devices pursuing a common goal is relevant in many types of perception and control system

environments. In general, such devices with embedded intelligence and sensing/actuating capabilities are heterogeneous, yet they need to interact seamlessly and intensively over a wired or wireless network.

The objective of the Biometric Access Control for Networked and e-commerce applications (BANCA) project is to develop and implement a complete secured system with enhanced identification, authentication and access control schemes for applications over the Internet tele-working and web-banking services.

Power Line Communication (PLC) has the disadvantage of low speed, functionality and high cost. The 6POWER project adapts and integrates products, applications and services that run with IPv6 and related protocols over Power Line, providing high speeds at low cost.

The INTELLECT project develops an electronic shop system including an online configuration module for products which is represented by 3D / Virtual Reality techniques and advanced user assistance and advice to improve the business opportunities for service providers and consultants as well as for manufacturers, wholesalers, sellers and customers.

Fi-WARE is a project working on an open architecture of a novel service infrastructure, building upon generic and reusable building blocks to support the Future Internet. SMARTCODE on the other hand is smart control of demand for consumption & supply to enable balanced, energy-positive buildings and neighbourhoods. The ELLIOT project aims to develop an IoT experiential platform where users/citizens are directly involved in co-creating, exploring and experimenting new ideas, concepts and technological artefacts related to IoT applications and services. IOT@WORK aims at developing the technologies required to enable IOT-based applications and processes in the manufacturing domain.

SMARTSANTANDER proposes a unique scale experimental research facility in support of typical applications and services for a smart city. The NOBEL project builds an energy brokerage system with which individual energy consumers can communicate their energy needs directly with both large-scale and small-scale energy producers, thereby making energy use more efficient. The brokerage system will use a middleware system to communicate energy consumption data and will use IPv6 technology to interconnect the middleware with sensors and energy meters on individual devices.

The EBBITS project aims to develop architecture, technologies and processes, which allow businesses to semantically integrate IoT into mainstream enterprise systems and support interoperable real-world, on-line end-to-end business applications. The lighthouse project Internet of Things Architecture IoT-A proposes the creation of an architectural reference model for the IoT as well as the definition of a set of key building blocks to lay the foundation for a ubiquitous IoT. Internet of Things Initiative-IOT-I aims at creating a joint strategic and technical vision of the IOT in Europe that encompasses the currently fragmented sectors. It will provide semantic resolution to the IoT and hence present a bridge between enterprise applications, people, services and the physical world, using information generated by tags, sensors, and other devices and performing actions on the real-world. IOT.EST is the IoT environment for service creation and testing. Interoperability between silo solutions and technologies used in disjoint sectors is important. The project integrates new types of services and generate new business opportunities through dynamic service creation environment that gathers and exploits data and information from sensors and actuators that use different communication technologies/formats

7. Potential research areas in IOT

Potential research areas in the IoT are (Dlodlo, 2011):

Governance: Without a standardised approach it is likely that a proliferation of architectures, identification schemes, protocols and frequencies will develop side by side, each one dedicated to a particular and separate use. This will lead to the fragmentation of IoT. Interoperability is a necessity, and inter-tag communication is a precondition

Ubiquitous networks: There are 2 major challenges to guarantee seamless network access: the first is that today different networks co-exist; the other is the sheer size of the IoT. Issues such as address

restriction, automatic address set-up, security functions such as authentication and encryption and 18 multicast functions to deliver voice and video have to be overcome by technological developments

Legislation, regulation and policy: A clear legislative framework ensuring the right of privacy and security level for all users must be implemented internationally.

Intelligent objects: The amount of intelligence that the objects in the IoT will need to have and if, how and in which cases this intelligence is distributed or centralised becomes a key factor. Interactive standards are associated with behavioural changes. Take, for example, a case in which an interactive device is implanted in the human body to deliver the right medicine at the right time. Intelligent nodes can be integrated into hybrid wireless networks and used in applications like monitoring of buildings and the environment, home automation and locating systems.

Security of the IoT: A major component of IoT is security and privacy of data.

Software and services: The development of the IoT is expected to come along with a new range of user-centric services, based on the interaction of day-to-day processes with the network. The delivery of those services will be frequently seamless for the user, requiring no specific interaction with them. The business model for the delivery of those services will require the interaction and collaboration of several organisations. In particular “event-driven” middleware and sensor “dynamic service capability declaration” is required.

Virtual and physical objects fusion: Applications may process data coming from both a 3D virtual world and from the real environment. New (merged) information processing management tools may be needed, for instance search engines capable of processing data from the physical and virtual worlds.

Geotagging / geocaching: Geographic information systems (GIS) play a role in locating things. An Internet of Places (IoP) can arise as more systems recognise where they are and can access GIS.

Biometrics: Identification of individuals combined with databases of information about people could have synergies with personal geolocation, enabling the IoT.

Machine vision: Image recognition could evolve towards characterising things’ behaviours not just their identities.

Robotics: Connected everyday objects and sensor networks are key enablers for robots. Onboard wireless communications may be critical for interconnecting robot systems.

Augmented reality: Researchers aim to enable systems to report context-sensitive information when people come into proximity with other people, places and things. Such information could appear on cell phone displays, wearable near-eye displays, head-up displays in vehicles, or using other convenient means.

Mirror worlds: Electronic media – whether a simple display or a complex virtual-reality platform – can help people visualise distant events and situations. Software can use icons and other abstractions to help visualise the location of real world objects. Objects including vehicles, personnel and equipment can self-report via various types of sensors, machine vision and other technologies.

Telepresence: Persons at a distance can access information gathered by an object and can control the actions of distant objects.

Tangible user interfaces: People can control technology by manipulating everyday objects rather than being limited to using keyboards, mice, displays and dedicated control surfaces.

QR Codes: Applications of QR code in the IoT are possible. Mobi.Ubiq provides mobile application and a web service that enables you to scan, discover and share objects with RFID or barcode tags. Based on the identified object, information and services become available. Mobi.Ubiq is a framework to connect everyday objects and supports building and interacting with the IoT.

Mobile devices and the IoT: Combining physical mobile interactions occurs when mobile devices are used to interact with physical objects in the IoT.

Mash-up applications – These are new services requiring appropriate levels of interface standardisation and interoperability, of dynamic configuration capability, an increased level of trust and associated information security supporting person privacy.

Business models in the IoT: With the advent of this technology various kinds of business models emerge.

Communication issues: These include antennae integration on chip, smart antennas, API – standardised and secure, modulation schemes, transmission and speed

Interoperability issues: These cover multi-tag integration, inter-tag communication, centralised and decentralised, with other communication networks.

8. Discussion

The preliminary results show Spain, Germany, Switzerland and Japan as the leading role players in the IoT industry. Other countries are Austria, Czech Republic, USA, France, Taiwan, Iran, Denmark, United Kingdom, Finland, Netherlands, China, Brazil, Sweden, Italy, Greece, Korea and Norway as players to a lesser extent. Overall, Europe is the leading continent and supports and spearheads IoT research through European Union Framework funding for consortia. China is also a strong contender, although there is little academic publication on their work. China though has a substantial number of IoT applications on the ground. Since this research has a foundation on literature that is available in the public domain, we cannot assume that the countries that do not appear on this list are not participating in any IoT research. It may be that they are keeping their work to their chests. The research also shows that it is the universities predominantly that are involved in IoT research as opposed to private sector companies. Universities are known to be areas that generate knowledge for the public domain as opposed to private companies whose main aim is to generate income from whatever they are involved in. It is not surprising therefore that private companies do not publish their work in the public domain.

IoT research can be approached from both a socio-economic and a technology research perspective. From a socio-economic perspective, social, legal, ethical, business, cultural security, privacy and regulatory aspects of IoT can be visited. The technologies that support the IoT are what we are traditionally familiar with, and what our education institutions teach. These technologies include wireless sensor networks, robotics, vision recognition, smart tags, microcontrollers, mobile devices, near-field communications, RFIDs, bar codes, social networks, EPCglobal networks, cloud computing, CoAP, 6LowPAN to name but a few. The question therefore is why these technologies should be rebranded the IoT, when they have been in existence in the market for a long time. To differentiate IoT from the traditional technologies, IoT research should therefore be in the form of integrating the traditional technologies to produce what is called IoT applications. Traditional technologies existing in isolation from one another cannot be branded the IoT. A standard definition of the IoT is still outstanding, judging from the varied definitions that are given in literature.

If the IoT is about adaptation of physical objects to be able to communicate via the Internet, then to design IoT applications a whole range of experts ranging from electrical and electronic engineers, computer scientists, programmers, information systems specialists, human science experts and creative specialists should constitute the team. IoT research is multidisciplinary in nature.

9. Conclusion

The study investigated who the current role players in the IoT were, what they are involved in and how this shapes the future direction of IoT research. IoT is an exciting and innovative field that talks about integrating various traditional technologies to produce new applications. Therefore it is about transforming the expert from one that is focused on one area of expertise to an all rounder that understands the various technologies and how they can be brought together. The research raises an awareness on the availability of the focused expertise from an international perspective, so that collaboration can be encouraged to produce these applications. Because IoT is a new field that is about redefining the role of the researcher, it also calls for a redefinition of the direction that current traditional research takes. It also opens opportunities for collaboration in multidisciplinary research. The opportunities for collaboration should take advantage of the potential of integrating technologies

in various domains. There are already leaders in the field and it is just a question of identifying after them the potential research areas in IoT that one can fit into. The EU is leading the pack because the organisation has ploughed resources in this direction. A few years down the line, the state of affairs is likely to change, with more role players coming in. This research is limited to the literature that is available currently, and as more role players publish their work the landscape will definitely change.

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Acceptable and Unacceptable Behaviour on Social Networking Sites: A Study of the Behavioural Norms of Youth on Facebook

Val Hooper and Tarika Kalidas
Victoria University of Wellington, New Zealand
val.hooper@vuw.ac.nz

Abstract: SNS offer many benefits, especially for the youth who are striving to establish their identity as young adults. The youth are the most active users of SNS but are also the biggest perpetrators of behaviour that would not be tolerated offline. Although differences between these two environments have been identified, the link between the underlying behavioural norms and what is regarded as acceptable and unacceptable behaviour online has not been comprehensively explored – even less so how that behaviour is determined. Given the gap in the knowledge and the prevalence of use by the youth, the objectives of this research were to determine: (1) what behaviour is regarded as acceptable/unacceptable on SNS, (2) how that is determined, and (3) whether there are differences between online behavioural norms and those that apply to offline behaviour. Guided by social cognitive theory, qualitative interviews were conducted with 16 youth aged 18-20 years who had Facebook accounts.

Findings indicate there is greater clarity on what is unacceptable behaviour than what is acceptable. Personal behavioural norms appear to guide determination of unacceptable behaviour whereas the lead of others' indicates acceptable behaviour. Acceptable behaviour appears to be more audience dependent than unacceptable behaviour, and there are strong indications of herding behaviour with regard to determination of acceptable norms.

The lack of clarity regarding acceptable online behavioural norms is distinctly different from the offline environment. The "protection" that the computer screen provides also contributes to the differences between offline and online behaviour. The distinction between types of friends that exists offline is emphasized online because users usually have one Facebook page that serves all audiences as opposed to encountering different groups separately as is the case offline. Online there is also the obligation to befriend people one normally would avoid offline.

Keywords/Phrases: Social networking sites; behavioural norms; youth; herding behaviour; mimetic theory; Facebook

1. Introduction

Social networking sites (SNS) offer many benefits, especially for the youth who are striving to establish their identity as young adults. Youth are the most active users of SNS, especially Facebook (McLaughlin & Vitak 2011), but also exhibit behaviours that would not be tolerated offline (Ahn, 2011). Although differences between these two environments have been identified, the link between the underlying behavioural norms, and what is regarded as acceptable and unacceptable behaviour online has not been comprehensively explored – even less so from the perspective of the youth.

Given the gap in the knowledge, and in answer to calls for further research into the role of social media and the youth (Ahn 2011; Steinfeld, Ellison & Lampe, 2008), the objectives of this research were to determine: (1) what behaviour on SNS (Facebook) is regarded by the youth as acceptable or unacceptable, (2) how that is determined, and (3) whether there are differences between online behavioural norms and those that apply to offline behaviour.

The following sections document the literature background to the study, the research method and findings, a discussion of the findings, and a conclusion.

2. Literature review

Boyd and Ellison (2007) define SNS as a web-based service that allows individuals to (1) construct a public or semi-public profile within a bounded system, (2) articulate a list of other users with whom they share a connection, and (3) view and traverse their list of connections and those made by others within the system. The display of one's friends differentiates SNS from other online media (Boyd & Ellison 2007) and with Facebook, for instance, both the user and their friends can contribute to the

site (Steinfeld et al. 2008). Facebook also offers the facility of creating different pages for different audiences.

Most people use SNS to contact new people; keep in touch with friends, and for general socializing (Brandtzaeg & Heim 2009). Social networking can increase social capacity by increasing the number of friends and depth of the relationships (Granovetter 1973). Implicit is the desire to build and maintain social capital - those benefits that come from strong relationships. This is particularly the case among the youth for whom SNS provide a place where they can develop their personal identity (Ahn 2011), and that is free from adult surveillance (Livingstone 2008). It is often seen as a place where they can develop their social identity reflexively and also develop confidence in that identity (Giddens, 1991). The feedback one receives from the SNS network determines how that identity develops (Ahn, 2011). SNS are furthermore seen as a place to experiment and take risks – the balance between opportunity and risk being viewed as self-actualization (Giddens, 1991), although what might be seen as opportunity-rich by young adults, might be perceived as risky by adults (Livingstone 2008).

SNS participation can thus have a significantly positive effect on self-esteem and psychological wellbeing (Valkenburg et al. 2006) but it can also result in detrimental behaviours such as bullying, especially amongst teenagers who are particularly sensitive to the opinions of their peers (Ahn, 2011). Additionally, apparent double standards regarding acceptable male and female behaviour seem to reinforce concerns about stereotyping (Bugeja in Walther, Van der heide & Kim, 2008).

1.1 SNS behaviour

SNS users perform two main tasks online: managing their self-identity and managing their relationships. Because SNS provide the opportunity to self present, users' postings reflect how they would like to be perceived (Ahn 2011). However, although users can control their initial selection of friends, they often feel obliged to accept subsequent friendship invitations from people they don't know (McLaughlin & Vitak 2008). This impacts their ability to fully control postings on their page. Some postings appear intended to embarrass, yet users often don't remove postings they don't like (Steinfeld et al. 2008). These reactions can be explained by the expectancy violation theory (Burgoon 1978) whereby negative violations by close friends are confronted but those by acquaintances are tolerated (McLaughlin & Vitak 2011). This point also illustrates the multiple audience nature of SNS (McLaughlin & Vitak 2011).

Because many of the non-verbal cues that would guide interpersonal interaction offline are not available online (Walther et al. 2008), other cues are used. In posting certain information, the user consciously leaves cues/signals about themselves (Walther et al. 2008). Sometimes this extends to exaggeration – which has come to be expected (Ellison, Heino & Gibbs, 2006). Unconscious cues provided by the user, such as choice of friends and network size, are regarded as good indicators of what they are like (Walther et al. 2008; Foulger, Ewbank, Kay, Popp & Carter, 2009). However, cues provided by others, are most influential. Warranting theory suggests that we judge people based on cues left by others. Others' descriptions are regarded as more objective and truthful than information posted by the user of themselves (Walther & Parks in Walther et al. 2008).

Although the motivation to join a SNS is positive – nurturing established relationships and building new ones - there is certain online activity that can be perceived as negative behaviour. However, behaviour such as online harassment and bullying is a manifestation of existing social, psychological and emotional predispositions of the individual. The technology is only the enabler (Ahn 2011). This also leads one to the question of the role and importance of social norms.

1.2 Norms of SNS behaviour

Social norms are the “customs, traditions, standards, rules, values, fashions and all other criteria of conduct which are standardized as a consequence of the contact of individuals” (Sherif in McLaughlin, 2011). There are different types of norms but those that are applicable on SNS are implicit norms (Burnett & Bonnici 2003), in other words, they are not formally documented and agreed by the community. In light of this implicit nature, individuals learn the applicable SNS behavioural norms through observation and interpretation of what they see. Social cognitive theory posits that we acquire these norms through observation and imitation (Bandura 1989). This occurs against the background of the norms that apply in real life (Ahn 2011). However, the way in which we interpret what we have observed is critical in determining what we shall and shall not imitate. Apart from the overall norms of

the society, the norms of the individual's different reference groups play an important role. During adolescence, for instance, peer influence is particularly strong, much stronger than that of the family (Guyer, McClure-Tone, Shiffrin, Pine & Nelson, 2009).

Because of the speed of SNS development, a set of explicit social norms guiding SNS behaviour has not yet emerged although some have been identified: be considerate of other members; don't publish over-emotional status reports. There also appears to be a norm of passivity among acquaintances and tolerance of "unacceptable" behaviour (McLaughlin & Vitak 2011).

Several differences between acceptable and unacceptable behaviour online (SNS) and offline have emerged. "Friends" offline usually refer to those one knows well. In SNS "friends" include close friends as well as acquaintances, and often people one doesn't even like. The number of SNS friends is consequently far greater than offline (Tong, Van der Heide, Langwell & Walther, 2008). There are differences in perceptions of privacy and property issues between the online and offline environments. The technology is seen as placing a distance between the actor and the "victim" whose rights might be infringed. The nature of the consequences for online behaviour is indirect, and there is often a lack of obvious consequences (Foulger et al. 2009). In addition, while the user can manipulate their SNS profile because of the time availability (Walther et al. 2008), offline encounters often require immediate response.

Despite differences between the online and offline environments having been identified, the link between the underlying behavioural norms, and what is regarded as acceptable and unacceptable behaviour online has not been comprehensively explored – even less so how that behaviour is determined. This research thus set out to address that gap by embarking on an exploration of what behaviour is regarded as acceptable/unacceptable on SNS, how that is determined, and whether there are differences between online and offline behavioural norms. Because the youth are the most prominent users of SNS, the study was approached from the perspective of the youth.

2. Theoretical lens

Given the significance of reference group influence, an appropriate theoretical lens through which to approach this research, and which has been adopted in various studies of group online behaviour, is that of herding behaviour bias (Dholakia & Soltysinski, 2001; Dholakia, Basuroy and Soltysinski, 2002).

Herding behaviour describes the behaviour of humans that appears to replicate the behaviour of herd of animals. Banerjee (1992) described how, even though an individual decision maker might possess their own private information, the decisions made by previous decision makers will outweigh that of the individual decision maker, particularly if a sufficient number of other decision makers has made a similar decision. The individual plus other decision makers thus all gravitate towards a common decision.

There are two levels of explanation of such behaviour. The first is that the herding behaviour is a manifestation of a type of heuristic, or short cut to decision making (Bikhchandi, Hirschleifer & Welch, 1992). Banerjee (1992) indicated that, in times of uncertainty, or when confronted with complex decisions and it was difficult to evaluate the options, then the decision maker relies on indicators such as the behaviour of preceding others. This is known as an informational cascade, particularly when there is a disregard for other personal information (Bikhchandi et al., 1992; Bikhchandi, Hirschleifer & Welch, 1998). There is also the perception that "consensus implies correctness" (Maheswaran & Chaiken, 1991). However, it is acknowledged that when decision making strategies are selected, there is a compromise between making the best decision and the amount of effort required to do so (Dholakia & Soltysinski, 2001).

The second explanation is deeper and that is that the behaviour stems from a desire to belong or to be like others. Mimetic theory indicates that we strive to be like someone we admire and our behaviour thus imitates theirs (Garrels, 2011). We also covet what they possess, and aspire to that to which they aspire. We thus either seek to acquire the object of desire or something similar, or try to succeed in attaining similar aspirational goals. In extreme cases, the "idol" becomes regarded as the competitor, to be vanquished in the pursuit of the desired object or aspiration.

A number of researchers in IS have explored herding behaviour and its effects. Duan, Gu and Whinston (2009) studied the impact of the public rankings of online software downloads on the download rates. They attributed the peaks and troughs to informational cascades. However, the concept of “herding behaviour bias” has been most prominently studied in the area of online auctions (Dholakia & Soltysinski, 2001; Dholakia et al., 2002; Gilkeson & Reynolds, 2003; Hooper, Huff & McDonald, 2007).

Gilkeson and Reynolds (2003) found that even when bidders had their own private information, they were still influenced by the action of others. Dholakia and Soltysinski (2001) found that bidders would overlook certain, possibly more valuable, listings in favour of listings that attracted more bidders. Bidders thus gravitated towards the desirable object, coveting what others were perceived to covet. Dholakia and Soltysinski (2001) also found that the “sunk cost” of having made the initial bid commitment, led to further commitment to that bidding process by the bidder. This relates to the conformity preserving processes of the “sunk cost effect” (Arkes & Hutzler, 2000) which indicates an increased commitment to a decision made. Hooper et al. (2007) found similar evidence of herding behaviour and mimetic rivalry between bidders.

As indicated, the outcome of such herding behaviour is not always advantageous but rather a compromise. For instance, Kennedy (2002) found that television presenters who sought to perform like one another, led to a disappointing profits. This sub-optimal outcome has been referred to by (Dholakia & Soltysinski, 2001) as the “winner’s curse”.

3. Research methodology

Guided by the herding behavioural perspective, and as this research was exploratory, an interpretative approach was adopted (Burrell & Morgan 1979). Qualitative interviews were conducted with 16 youth, aged 18-20 years, and who had a Facebook account. This age group was chosen because they typically go through a number of social changes at that age – often dependent on leaving school. Facebook is the most popular SNS worldwide, and youth are the most active Facebook users (McLaughlin & Vitak, 2011). Stratified convenience sampling was used to ensure equal representation of males and females. The group included students, who all worked part-time, and full-time workforce employees. The interview transcripts were coded according to themes and analysed (Byrne 2001). These themes, including sub-themes, focussed on motivation to join Facebook; categories of audiences; acceptable and unacceptable behaviour; ways of determining acceptable behaviour; and differences between acceptable and unacceptable behaviour.

4. Findings

The findings are reported according to the main areas explored.

Both male and female respondents indicated that, in order of preference the most common groups people they did not they interacted with on Facebook were friends, family, work associates, acquaintances, and even particularly like.

“People I’ve accepted but don’t like to talk to” (M)

We term the latter two groups “acquaintances” and “non-friends” depending on the extent of dislike. These were people who were work associates, or people who had been referred by friends, family members or work associates. They were “accepted” or tolerated for the sake of that relationship and the desire not to cause offense by not accepting that invitation.

The motivation to participate in Facebook was mainly to keep in touch with friends and family. For this age group, many of their friends had moved away after school, or they had moved to another city for employment reasons. Other strong motivations were to build relationships with new friends; and also to build more collegial relationships with work associates. Apart from family members who covered a range of ages, all the other groups with whom the respondents interacted were in more or less the same age as themselves.

4.1 Acceptable behaviour on Facebook

Respondents all took a while to consider their responses to this topic.

They all seemed clear on acceptable behaviour with regard to family and work associates. In interacting with family, most respondents regarded polite and respectful behaviour as acceptable. A more conservative approach was favoured by all – mainly to avoid embarrassment or shame.

“I’d say when it comes to family, you’d want to keep things pretty tame” (M)

A similar approach was applied to work associates. Respondents wished to keep things on a professional level and ensure that their reputation was not compromised.

However, there were distinctions between the sort of behaviour deemed acceptable for close friends and those who were acquaintances or non-friends. In interacting with friends, the most commonly accepted behaviour was similar to what was acceptable offline. Female perceptions were that this included not posting rude or offensive material on each other’s walls. Many males (44%) indicated that anything was acceptable when interacting with friends on Facebook.

“Well, with my friends anything is acceptable really There are no barriers when it comes to my mates. We’re all pretty open with everything” (M)

Yet this standard did not seem to apply similarly to acquaintances.

“ ... with online friends that I haven’t actually met [offline] ... I would probably be a bit more lenient if I didn’t actually know them personally” (F)

In terms of interaction with non-friends, the general response was to only post a minimal amount of personal information on one’s profile.

4.2 Unacceptable behaviour on Facebook

Respondents identified unacceptable behaviour much more easily than acceptable behaviour.

With regard to friends, nearly 90% of respondents indicated that they did not expect to see information that was too personal.

“I don’t think it’s acceptable when you put personal problems and stuff up on Facebook ... and announce it to the whole world” (M)

With family, coarse language was unacceptable or posting explicit messages on one’s profile. Respondents also felt that it was unacceptable to discuss relationships on Facebook, either with family or allowing family members to see them.

“You wouldn’t go on hard out about relationships and stuff ... about girlfriends ... I don’t want my family to see that stuff” (M)

The same sort of behaviour was considered unacceptable in terms of what was communicated to work associates. The general feeling was to avoid becoming too friendly with these associates because it might compromise the professional relationship. In terms of interacting with acquaintances or non-friends, posting any personal information, particularly problems and private information was unacceptable.

4.3 Determining acceptable and unacceptable behaviour on Facebook

When it came to determining what was and what was not acceptable behaviour on Facebook, a recurring theme amongst respondents was to observe others’ behaviour and then copy what they perceived as acceptable.

“Well, seeing what they do on Facebook ... the stuff they write, the type of pictures they put up ... I kind of copy from their examples” (F)

Another, less frequently employed way of deciding what behaviour was acceptable, was through trial and error.

“I just tried behaving the same as I would normally, then I would go by the responses I got from people With positive responses I realised those types of things were acceptable” (M)

Some respondents (about 30%) indicated that what was acceptable offline applied online. However, all respondents used the same guidelines for what was unacceptable offline, online.

“I go by what I consider to be unacceptable in real life” (F)

Personal beliefs and values seemed to guide many of the respondents.

“I guess it’s just kind of my upbringing and my personal beliefs and morals. I wouldn’t want someone to do something to me which I wouldn’t do to them” (M)

4.4 Experiences and consequences

In order to uncover any further indications of acceptable and unacceptable behaviour, respondents’ experiences on Facebook were explored.

All respondents were able to identify positive experiences, the most common of which were being able to catch up with old friends, getting to know people better, and meeting new people.

“I started a group on Facebook, about baking. I like baking. We’ve got over 350 members, and that was just me. I just wanted to start a group which just shared baking photos and experiences with people.” (F)

Negative experiences, related by most respondents (60%), were associated with security, privacy, and undesirable postings.

“Well, people hacking into my account and leaving comments and stuff – that gets a bit annoying” (M).

Another negative experience was receiving “friend” requests from random people. There was also the concern regarding the sort of information which such people could access. One respondent indicated how random people stalked them through the use of a Facebook account.

As a result of the negative experiences, the most common change in behaviour was a change in privacy settings.

“I’ve changed my profile to fully private so only people that I know can see it, just because I feel safer that way. I don’t want random people looking at it” (F)

Others noted that they were careful about what they published on their profiles.

“I’m far more conscious of what I publish ... well I know that anything that goes online stays online, even if you delete it” (M)

A few respondents changed the way they behaved, bearing future employers in mind.

Interestingly, these responses did not relate to discussions on (un)acceptable behaviour or the online/offline differences. Those were more from the first person perspective – what they should (not) do - whereas these responses focused on what others had done to them and how they had reacted.

4.5 Differences between online (Facebook) and offline behaviour

All except three respondents were of the opinion that there were differences between the way people behaved offline and on Facebook. Most respondents noted that in a face-to-face environment people were not able to talk freely. The ability to talk to someone without having to see their facial expressions and determine the consequences of what was being said, meant that people had the freedom to say what they wanted without hesitation – and this included discussing their personal problems and issues.

“Just because you’re behind the computer screen, you’ve got that safety net. You’re not actually talking to them so if you feel uncomfortable with the conversation, you can just disconnect and disappear, and never see them again. But if you’re face-to-face, you can’t escape that easily. You’ve also got that social decorum to follow and things like that” (F)

Because of the opportunity to avoid face-to-face interaction, people appeared to not be too concerned about the immediate consequences of what they said online. This gave people greater freedom to express themselves honestly.

“If you’ve been avoiding saying something, you could say it online not necessarily publicly and it could be easier that way” (M).

The respondents recognised that people who were shy and conservative were more open online. Their level of comfort increased greatly when interacting online.

Despite the strong indications of what behaviour was unacceptable on Facebook, contradictions seem possible due to the noted freedom that the computer screen provides.

5. Discussion

All respondents indicated that their Facebook activities had a positive influence on their lives. By using Facebook, they were able to keep in touch with friends and family (Brandtzaeg & Heim, 2009), communicate with others more often (Ahn, 2011, Walther et al., 2008) and build stronger relationships (Granovetter, 1973).

It was noticeable that although respondents had definite views as to what sort of Facebook behaviour was unacceptable, they were not as clear on what was acceptable and many tried to establish guidelines for themselves by first observing then copying the actions of others (Burke et al, 2009), or by trial and error. This split in certainty might be ascribable to the fact that many of the codes of conduct that govern our everyday lives, such as religious codes and legal systems, are couched in terms of what is not allowed rather than in terms of what is allowed. With regard to what behaviour was unacceptable, it seems that respondents followed their own counsel (Ahn, 2001) and the probability is high that they drew on these codes and systems for guidance. With regard to what behaviour was acceptable, there is strong evidence of herding behaviour (Dholakia & Soltysinski, 2001). This took two forms. On the one hand, some respondents indicated that their main focus was to communicate so they sought the most expedient way of finding out how to do so in an acceptable fashion. That was to watch and copy. This is reflective of the heuristic motivation suggested by Dholakia et al. (2002). The second form was to emulate admired others (Garrels, 2011) This was prevalent among both males and females with the males indicating a desire to be like friends they admired because they had "succeeded". The stereotypical behaviour was also reflective of not only being like a group but also trying to emulate the nonchalant, attitude of many stars of the screen. This is a typical example of mimetic behaviour (Garrels, 2011).

Activity on Facebook requires cognisance of its multi-audience nature (McLaughlin & Vitak, 2001). Awareness of (un)acceptability of content for different audiences came through very strongly in the distinctions that respondents made between audiences. The need to accommodate changes within themselves according to their different life stages was also evident in the respondents' awareness of the need to be more cautious of what they put online and of the chances that future employers might see the content (Ahn, 2011).

When discussing acceptable behaviour per se, the male respondents appeared to be tolerant of all sorts of behaviour, especially for close friends whereas females tended to require respectful behaviour which did not hurt or embarrass people. This could be interpreted as reinforcing the gender-specific stereotyping, which is a version of herding or imitation of admired role models (Garrels, 2011). However, when discussing negative experiences, a number of males indicated their annoyance at having their online privacy breached (Walther et al., 2008). Some also noted that they had Facebook "friends" whom they didn't like. The tolerant attitude exhibited initially might not be so but rather young males feeling the need to act stereotypically (Bujega in Walther et al., 2008). This raises the interesting question of whether herding behaviour has a stronger influence at certain times and in certain conditions than at other times and in other conditions. There is also the aspect of compromise in choice alluded to by Dholakia and Soltysinski (2001), and Kennedy (2002).

Another insight gained was that while discussions of (un)acceptable behaviour focused on the first person, the user, the respondents did not include the experiences they had had as a third person so that breaching another's privacy, was not mentioned as unacceptable behaviour per se but was rather implied. The following lists of acceptable and unacceptable Facebook behaviour emerged, whether explicitly or implicitly:

Acceptable behaviour

- Respectful, polite postings – audience dependent
- Anything – audience dependent and irrespective of who had posted; possibly gender dependent
- Tolerance of other's postings – depending on who had posted
- Professional – audience dependent

Unacceptable behaviour

- Rude or offensive postings (McLaughlin & Vitak, 2001)

- Embarrassing postings (McLaughlin & Vitak, 2001)
- Coarse language
- Too much, too intimate, and too detailed personal information (McLaughlin & Vitak, 2001)
- Unprofessional content – audience dependent
- Breaching others' privacy
- Randomly requesting friendship
- Pestering a friends' friends
- Stalking

Indications of the extent of acceptability of certain behaviours depending on the audience, further emphasize the multi-audience nature of Facebook. Although multiple audiences exist for an individual offline so that herding may take place to a greater or lesser extent with each group, the groups are usually encountered separately. However, an individual usually has one Facebook page that serves all audiences together. This is despite the fact that separate pages can be set up on Facebook for different audiences. Nevertheless, even if separate pages are established, the lack of control over "friends" and their friends has the potential to minimise the effect of differentiation of postings. Online there also appears to be the obligation to befriend people one would normally avoid offline. This is possibly because of the overt (recorded) nature of rejections/avoidances, and implications for the original relationship. Seen alternatively, this could be viewed as the manifestations of a greater/lesser desire to herd (Dholakia & Soltysinski, 2001), The implication of a herding bias or elements of mimesis, which exert either a greater or lesser influence on the way in which users behave online with regard to different groups, further supports the question of whether, and under which conditions/situations such influence waxes and wanes.

The lack of clarity regarding acceptable behavioural norms is distinctly different from offline. The protection that the computer screen affords the user also appears to have contributed to the difference between what is and what is not acceptable in the online and offline environments. The freedom to "say" things without fear of seeing, and being influenced by, the reaction in the other's expression, plus having the ability to withdraw immediately if the situation became too uncomfortable is the advantage of the online environment (Walther & Parks, 2002). Plus, the time differential allows the user to couch the message in the most suitable manner without having to respond immediately as is often the case offline. This might be regarded as the tyranny of the face-to-face encounter and whereas some might regard the SNS environment as being anarchistic and even cruel, an alternative approach is to view it as one which is more honest and open and free from the constraints of the face-to-face facade which many of us adopt offline. An aspect worth considering, though, is the potential carelessness with which hurtful statements could be made behind the protection of the screen. Another aspect is that respondents felt that not knowing someone offline almost made them less real and therefore more distant and less likely to affect them. Consequently, behaviour which might otherwise have been regarded as unacceptable was tolerated. These scenarios also indicate a decrease in the extent of the herding bias, and that the computer screen could be seen as shield against others' influence and the need to herd with them.

6. Conclusion and implications

The research has explored two issues: (1) what behaviour is regarded by the youth as acceptable or unacceptable in SNS (Facebook), (2) how respective behavioural develop, and (3) whether there are differences between online behavioural norms and those that apply to offline behaviour. The research adopted a herding behaviour lens as the theoretical underpinning of the study.

There was greater clarity on what was unacceptable behaviour than what was acceptable. Personal behavioural norms appeared to guide determination of unacceptable behaviour whereas the lead of others indicated acceptable behaviour. Acceptable behaviour appears to be more audience dependent than unacceptable behaviour. Different audiences become more or less relevant over time and certain audiences may be added at different periods of time. Even though there is the facility on Facebook to create audience-specific pages, most users use a single page for all their "friends". This indicates a need for the youth to be alerted to the multiple audiences and that present postings for one audience might become available to other audiences at any future time. There was also the hint at different behavioural norms might apply to the user themselves as opposed to a third party.

The “protection” that the computer screen provides, has considerable influence on the differences between offline and online behaviour. This can be regarded as liberating and advantageous, but can also have negative consequences. Furthermore, the distinction between types of friends and audiences that does exist offline is emphasized online because users usually have one Facebook page that serves all audiences. Even if differentiations are made between audiences, the lack of control over the network reach can override those distinctions. Other, more targeted SNS like LinkedIn with its professional contact focus, might not require such audience category caution.

In all these findings, there was strong evidence of herding behaviour, whether driven more by mimesis and the desire to be like others, or as a type of heuristic. At different times, in different conditions, and with regard to different audiences, the herding influence appeared stronger or weaker. There was also evidence of compromise with regard to perceptions of acceptable behaviour.

The findings have yielded insights for academics and users, parents, educators and businessmen alike. For academics, a number of questions have arisen that need further exploration:

- How strong is the herding behaviour bias in SNS with regard to:
 - Different reference groups,
 - Over time, and in
 - Different situations
- Do different SNS behavioural norms apply for ourselves and for others?

The research findings also carry implications for Facebook users, parents, educators, policy makers, managers, and marketers. Users need to be aware of what they can and what they cannot control on Facebook; clear on what they regard as acceptable and unacceptable behaviour; and that what might seem appropriate for one audience group might not be so for another group, nor that what might seem appropriate for one stage of their lives might not seem so at a later stage. This is more easily said than done and it becomes more of a challenge when the entry age for Facebook is 13 and the teens are a period when peer pressure is very strong.

Although many SNS like Facebook provide guidance to users on appropriate use of the SNS, much of the responsibility lies with the parents, primarily, educators and policy makers to inculcate socially acceptable behavioural norms into the youth. Care should be taken to address all sides of an argument such as the freedom which the screen does provide and whether it's better to maintain the face-to-face “facade” or to view the online channel as an opportunity for greater honesty and openness. Great benefit has been derived from Facebook and SNS and behaviours that result in these benefits should be facilitated. Where there is ambiguity regarding acceptable behaviour, guidance is needed. The use of suitable role models who can be emulated has worked well in similar situations.

Managers have a particularly important role to play. The youth are their young/future employees, who represent the organization to the world. In addition to what is placed on official organization Facebook pages, managers can be quite clear on what sort of behaviour is acceptable and what is not. Preventative action in terms of clearly stated policies could prevent considerable embarrassment later. Leading by an example which others could follow is another positive way of ensuring acceptable behaviour.

Marketers could also use these Facebook insights in the way in which they pitch promotional messages. Facebook provides a rich source of ethnographic data that would be hard to collect in another way.

Generally, the benefits derived from Facebook activity seem to far outweigh any disadvantages. Differences between Facebook and offline behavioural norms require acknowledgement and guidance in negotiating, and acceptable behavioural norms need to be firmly established.

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Internet Users Lived Experiences of Cultural (Values, Norms and Verbal Symbols) Changes in Iran Higher Education : Ethics and Philosophy topics

Narges Keshtiaray and Akram Akbarian

Islamic Azad University, Khorasgan (Isfahan) Branch, Isfahan, IRAN

Islamic Azad University, Science & Researches Branch, Isfahan, IRAN

Keshtiaray@gmail.com

Ak.Akbarian@gmail.com

Abstract: The present study qualitatively assesses Internet users' experiences of cultural changes. The type of method is phenomenological. Research participants were 14 university students from Khorasgan Islamic Azad University with intensity case sampling. The subjects were introduced by the administrator of the Internet site. Data collection was conducted by a semi-structured interview and data were analyzed by Colaizzi 7-step method. Total findings of this study after excluding common codes, including 236 concept codes that represented the experiences of participants in this study, were classified in three main themes as follows: 1 - Change of Values such as Opinions, Beliefs and Morality (" Change of Beliefs " and " Lack of the Observation of Moral Laws ") 2 - Norm Change ("Life Style Changing" that come from Change of Tasks Doing Way, Change of Communication Way, Accelerate of knowledge exchanging and Social Participation Changing and " Change of Identity "that come from False Freedom and Corruption, Distrust, Social Change and Change of Wearing Mode) and 3 - A Change in Verbal Symbols (" Influence of English Words in Farsi "and" Getting Loan Terms from the Internet "). These findings indicate that students have acquired a lot of positive and negative experiences while using the Internet which have affected the norms, ideas, beliefs, ethics and verbal symbols showing cultural changes in the society which mostly affect the young of Symbols, Internet Users

1. Introduction

"What is the culture of a place that is everywhere and nowhere, that is at once global but renders the globe obsolete, which globalizes the individual yet strips our individuality? This is the intriguing paradox that the Internet presents to us, one that requires us to look beyond what we can easily see or hear or touch"(Federman, 2003). The massive networks break geographical and political borders from above the planet and the sound and visual waves intrude all nations live privacies. These have made cultural boundaries pale. Cyber space has influenced language, literature, social identity and other dimensions of human life, and as a group of thinkers believe, culture is a symbol of spiritual growth and progress of a society, and the Internet has been effective in this regard. Giddens considered culture to be a set of values, norms and material goods of a particular group, taking it to be four real and irreducible elements of ideas and beliefs, values, norms and symbols. Therefore, this study combined total values _ the focus of religious beliefs and symbols _ the norms and symbols to be equivalent to the culture. Online interactions that cause these capabilities provide the functionality which can lead to the formation of new cultures. The Internet operates in two ways: first introduces and defines the dominant culture and on the other hand provides pathways for other cultures. Internet users have access to pioneering and leading cultural processes. Internet causes a bilateral connection. It can be said that if it is only used for entertainment, it is properly similar to the TV.

The internet is the global techno – social system that is based on a global, decentralized technological structure consisting of networked computer networks that store objectified human knowledge (Fuchs, 2008: 122).

Cybernetic is, fundamentally, concerned with control and communication and the relationship between a mechanism and its environment (Shaw, 2008: 89).

Cyberspace refers to the collections of human internal communication through computer and telecommunication devices without taking physical geography into account. The online system is a sample of Cyber space in which its users can communicate with each other through mail. Unlike real spaces, Cyber space requires no physical movements and all the acts can be done only through pressure on keys or "mouse" movements (Suler, 2008). Internet can be a lifestyle change that requires no face to face contact and that links thousands of people to each other.

Ogan (2007) notes that interactive media technologies such as Internet are altering the one-way media domination or information flow from the industrialized to the developing nations of the yesteryear (see Dizard, 2000).

From the point of view of globalization, in fact perhaps from any point of view, all of these developments pale in comparison to the creation of the first personal computers in the mid – 1970s, and then Internet in the 1990s. Personal computers and the Internet are now deeply implicated in and essential to all of technological developments mentioned above, as well as most others. Personal computers and the Internet paved the way for global Internet transactions and interpersonal relationships of all sorts (e.g. Facebook)(Ritzer, 2011: 135).

Nowadays, Face book has been able to gather the numbers of people together, regardless of their languages and nationalities, and has been able to make them closed in a friendly network that sometimes causes social changes through extending these communications.

Social changes facilitated by the diffusion of communication technologies in one society may no longer be confined by these artificial boundaries (Lin, 2007: 3).

Even if such changes wouldn't occur, we would deal with cultural changes by rotating the old thoughts and behaviors of people. Such a culture is drawn from cyber space which users can exchange among themselves.

Cyber culture is a life world of online meaning and value production and reproduction that is organized in the form of virtual communities. A virtual community is the subsystem of the cyber culture system of society (Fuchs, 2008: 303).

All this is the evidence of the events that happened and were influenced by the development of technology, information revolution and the Internet. Although technology innovations have the potential to become the equalizer for social, political, and economic development inequities among societies, but information and knowledge gaps exist within the borders an information society. These information and knowledge gaps, along with other cultural changes, are a result of how individuals use communication and information technologies to act as part of the cultural system in different social cultural setting.

It is clear that the influence of these mediated communication technologies has been evolutionary. There is a need to review these events and changes to make their influences clearer. In order to investigate the issue, this article tried to discover the real relationships resulting from due to cultural changes via the approach of phenomenology with regards to the comprehensive experiences of Internet users. This research aims at investigating the effects of the internet on some aspects of culture, like norms, beliefs and verbal symbols from the Internet users' viewpoints.

2. Research methodology

The present research is a qualitative study of phenomenological type. As the subject of study for this research indicates, understanding and experiences of Internet users of cultural changes are the main issue, and the University of Khorasgan was selected as a research environment. So, the researcher referred to the University site administrator to have access to 14 students who had used Internet more than others. After they expressed their willingness to participate and allowed the researcher to record the interview and they were assured of the confidentiality of their information, the interview started. After each interview, the text was transcribed on paper and coded, and then interviews continued one after the other until no more new information was received. Each time the interview took about 20 to 60 minutes, depending on the opportunity and willingness of participants. Interviews were conducted in a quiet part of the site in leisure hours as the students had accepted. Because the interviews were semi-structured, the researcher tried to hold the interview guide questions only in the framework based on the aims of the research. In the end, to ensure that proper content had been obtained, the written text was subsequently sent to their email address for confirmation.

In this study, after the information was clustered in categories of topics, the contents outside the categories were deleted; however, they was not much added content. Thus, the repeated, accurate and relevant facts remained and the validity of the research was established. In qualitative research, more credit is given to reliability. The basic question in reliability assessment is whether the

researchers see what they thought or not. There are three possible error types in this connection: 1) Accepting a relationship where there is no such relationship. 2) Denial of a relationship or a principle where there is a relationship in fact, and 3) finally, asking the wrong questions (Kirk & Miller, 1986: 29-30). The researcher tried to avoid such mistakes, as the Colaizzi process analysis entails. To ensure the accuracy of all general concepts, they were sent to all participants and their confirmations were received. Flick (2006) calls this method "Evaluation of reliability by communication method". The ability to conduct an interview is important for validity and reliability because in this type of research a researcher is considered a research tool. In order to achieve accurate and precise interviews, the researcher conducted two pilot interviews to test the accuracy of the instruments. The researcher tried to "Rebuild Reality" for reporting so that the reality could be expressed according to what is valid and factual.

3. Results

Interview text was analyzed by Colaizzi method. The findings from this study, after excluding shared codes, included 236 concept codes extracted from the interviews that were placed in three main categories and six sub-categories as it is evident in chart (1).

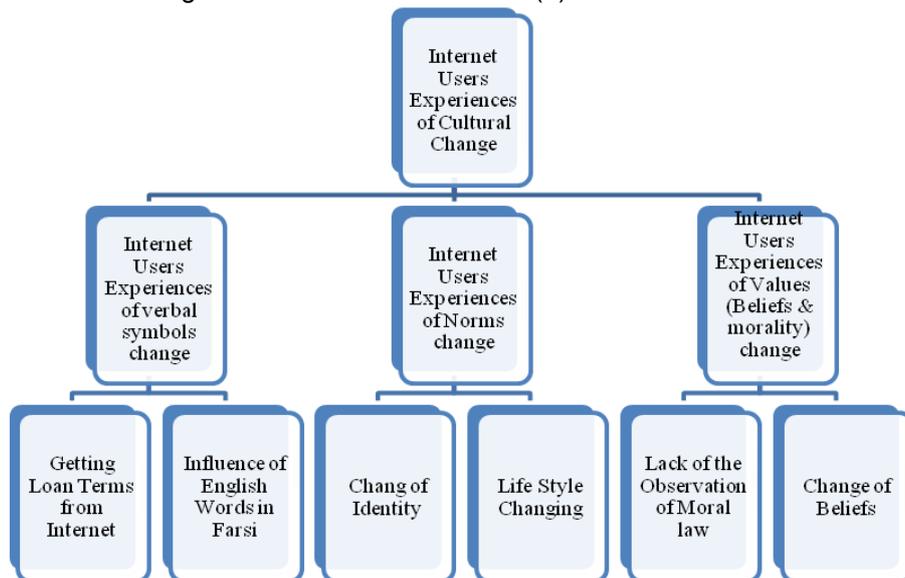


Figure (1) Internet Users Experiences of Cultural Change

3.1 Users' Experiences of Value Changes (Opinions, Beliefs and Morality)

Considering the experience obtained from the students, Internet has caused changes in students' opinions, religious beliefs and moral values, which are all valuable elements. In other words, this main concept consists of two main categories: "changes in thoughts and ideas" and "lack of observation of moral laws" as it is evident in chart (2). Some of the contents obtained from the integration of the concepts and terms employed by the participants are mentioned here: "For example, there are websites that affect the opinions of young people, especially those of beliefs, if the young are not strong "(Participant 9). "A site said, if you click here you will not play anymore" (Participant 8). "Ethics on the Internet are not adhered to and internet crimes are abundant, like hacking" (Participant 5).

3.2 Users' Experiences of Norms Change

Users' experiences significant changes in the circle that is being considered as norm: for example, it can be referred to participant (5) who pointed out that: "I do the services myself and that of my family online." For example, participant (1) says: "changes in communication have caused social changes " or student (10), who says: "When you send an email, it is not necessary to visit your professor.", "We get a conference and chat with some colleagues about the cooperation of various projects that we want to present by brain storming and complete each other's views" (participant 2). The outcome shapes with the group by the title of "lifestyle change and social activities". Also issues such as "In chats 99% of them lie" (Participant 5) and that "They change their identity and alter themselves, after that they may create a new identity and may believe in it and lose their goals" (Participant 8) "or perhaps even one day I may change my identity and say that I am not an Iranian " (Participant 1) or."

For example, some people went to certain sites and became members of a political group, cultural invasion issues or other problems affected them and they were completely changed "(Participant 9). This will be merged in a group by the name "Identity Change" as it is evident in the chart (3).

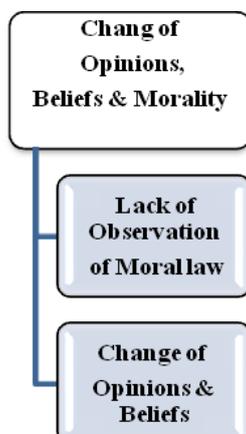


Figure (2) Internet Users' Experiences of values changes (opinions, beliefs and morality)

Katz and Rice (2002) conclude from five successive quantitative surveys (1994, 1995, 1996, 1997, 2000) that “users tend to communicate with others through other media (especially telephone) more than non – users do, meet more with their friends, and interact more with others in general, although in a more widely dispersed physical environment ... Clearly long – term Internet usage is associated with more, not less, frequent sociability” (Katz and Rice 2002: 135-132)

Philip N. Howard (2004:17), from a study based on more than 5,000 surveys, concludes that “overall, people who join society online believe that they know more people as a result”.

Al Lily(2011) notes the Saudi female population, which is characterized as sheltered, hard-to-reach and conservative, is arousing good interest globally (and nationally). He has provided a background to and justification for a forthcoming study in the form of a literature review, which examine how technology-facilitated communication has shaped the social–cultural pattern of Saudi female experience within academia.

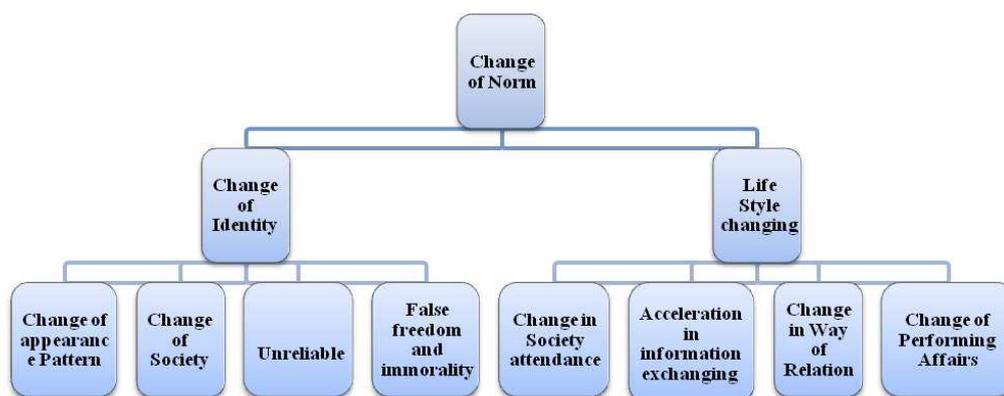


Figure (3) Internet Users' Experiences of Norms Change

3.3 Users' Experiences of Verbal Symbols Change

Research has shown in this part that Internet users have faced changes in cultural symbols, particularly verbal symbols and expressions in Persian as it is evident in the chart (4). For example, participant 6 says: "Internet affects Persian spoken language" or another participant (Participant 8) asserts “different characters and words are a lot and we use them without knowing their history and origin "and also" there are some words that we use in our daily lives and work with and we repeat them, like chat " or participant 7 acknowledged that "because you use the Internet you are forced to use English words, or the English text or know their meanings." The close connection between language, communication technologies, subjectivity and cultural forms is the concern of Marshal

McLuhan in his now famous books "The Guttenberg Galaxy" (1962) and "Understanding Media" (1964). Although Marshall McLuhan's (2001]1967[: 63) pronouncement that "we now live in a global village ..."

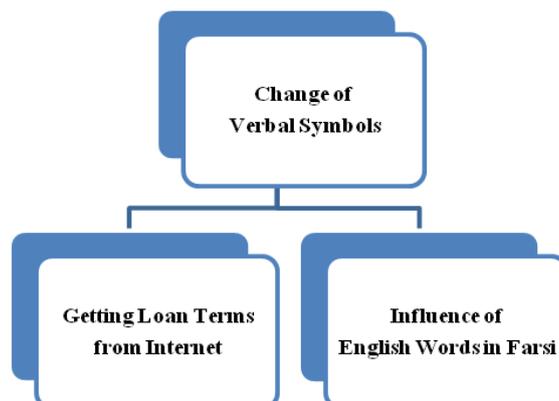


Figure (4) Internet Users' Experiences of Verbal Symbols Change

4. Conclusion

Culture (composed of values, norms and symbols) changes when faced with some new elements. It can be studied better if it is divided into its constituent elements. According to the findings of this study, Internet changes beliefs and religious beliefs and ethics of its users.

Religious belief and laws are regulations for the affairs of society and to develop people. Since the ideas and beliefs of religious communities are usually considered as community values, they are used as control or deterrent forces. Shoemaker (1996:157) stated that the deterrence theory can indicate that the correct and deviant behaviors have two reinforcing elements: an internal control system and an external control system. The hypothesis is that strong internal deterrent and external deterrent insulate the person against perverted behavior. Inner values and beliefs that protect human beings from committing error are the same powerful internal deterrents.

A young person with a weak external deterrent must be guided by the internal control system. If the outer shield is relatively strong and effective, the defense of his internal system should not play a critical role. Similarly, if the internal controls of the young person are not likely to equate common pressures, an effective external defense may help him control himself and provide acceptable behavior. But if internal defense works well, there is no need for the outer structure to intervene (Reckless, 1961: 42 - 46). But if the inner defense is not qualified because of the change in beliefs and opinions, does the external law suffice him? This issue highlights the importance of religious beliefs that can discolor or change false information mixed in cyber space usually with rich and diverse information.

College students were examined to test whether sensation seeking and perceived stress would predict abuse of the Internet by Velezmoro, Lacefield & Roberti (2010). Previous studies have found that disinhibition, boredom susceptibility, and total sensation seeking scores were related to Internet abuse. Because stress has been documented to have a negative effect on students and may be linked to Internet use, it was tested as a possible predictor of Internet abuse. This study also analyzed abuse of the Internet for sexual purposes, because sexuality is prevalent online, and college students are in an age of sexual exploration (Velezmoro, Lacefield & Roberti, 2010).

Clerc (2002) demonstrated in her study that everyday people use the Internet and copyright law reform should come into place. This indicates lack of moral principles and values regarding some issues that approve this research result.

Internet makes new norms which base them on new values but the values are not the former, just the same ideas, new beliefs have replaced them with no similarity because the Internet does not belong to a specific category of opinions and beliefs. Based on this problem changes in values and norms appear.

Other results indicate a change in cultural norms in the two sub-themes of "Changes in lifestyle and Daily Activities" and "Change in Identity" which both suggest nice and developmental changes and a change in national identity, ethnics, nature and Iranian positive characteristics. Findings of Na (2006) acknowledged the increasing use of the Internet affects the suitability of social activities

Hafeznia and colleagues (2006) also presented in their research the fact that expanding the relationship between globalization processes in the form of information and communication technologies (satellite and internet) with national identity showed that increased rate of use of information technology reduces the national interests.

Result of Rahmani & Gholamali Lavasani(2011) research revealed a positive significant relation ($P < 0.01$) between internet dependency with overall sensation seeking and sub scales of disinhibition and boredom susceptibility.

Another main code in this research shows changes in the form of verbal symbols in Persian. Symbols form a part of the culture of people that can spread easily in social interactions, that people learn them willingly or unwillingly. One of the most prominent symbols is language which is under the verbal kind and can be affected more due to different types of changes, especially where one language becomes dominant and the other recessive. Giddens believes that by communications revolution it is possible to connect computers to satellite technology so that one can communicate rapidly at any time with anyone and anywhere in the world, and this instant communication can change many aspects of our lives. It is here that slowly and sometimes with full acceleration, terms of one language drive into another, even sometimes there are no existing equations for some technical terms, therefore the same words are used.

Changes in values, norms and symbols can be considered as changes in cultural norms which ring the alarm for the future. Of course, it is not suggested to traverse all the nice things technology brings, rather we suggest making decisions, planning, guidance and in a word management for this generation and the next generation in order for them to minimize the problems and challenges. These necessary changes double and make clearer the consciousness of the authorities in culture so that they can take measures to preserve traditional values and norms of society in confrontation with new cultural policies and measures. In this regard, strengthening the family institution as a focus to maintain values and beliefs and to avoid deviations is more important than the past. It is also suggested to apply the advice provided by social institutions and civil society forces such as religious leaders, intellectuals and distinguished personalities to stand against the influx of media information more than before.

To prevent deviations, false freedom, and abnormalities that cover concepts obtained from this research, it is imperative to strengthen the national media or programs promoting our own culture as a proposed solution to confront the problems. One of the reasons expressed for changes is the delay of cultural emancipation of the society towards the issue. There should be public education in this regard. This technology is in progress. The professionals should be aware of the problems quickly before it is too late in order to identify the solutions and inform the people before the rising of any problem arises.

Disobedience of the law and ethics, which was one of the obtained codes, necessitates law enforcement units to make appropriate secondary institutions ready at a national level with appropriate technical facilities through all the media to discover lewd men, deception, Internet extortion and various fraud moves. People and families must be notified of existing risks and threats via the proper way, while caring, and suggesting that they should not do away with the Internet in general.

Stephen Coleman (2005) argues that blogs could help establish a new politics of listening in which everyone has a voice. They could become "sophisticated listening posts of modern democracy" and sources "of nourishment for a kind of democracy in which everyone's accounts counts" (Coleman 2005: 274).

Communication technologies have allowed us to share our experiences and cultures wherever these linkages exist. Even though national borders survive today, they're essentially political boundaries maintained by nation – states (e.g., Margolis & Resnick, 2000; Pelton, 2003).

Recchiuti (2003) identified three common motives - information seeking, interpersonal utility, and entertainment – to all three forms of CMC studied. Separate motives found for using e-mail included: (a) convenience, or because it is easy and comfortable; (b) pass time, or when they have nothing better to do; and (c) escape, or to get away from work and other pressures. Three motives were unique to IM use, including (a) escape; (b) companionship, or to overcome feelings of loneliness; and (c) anonymity, out of a desire to be anonymous. Two additional motives were identified for online chat room use, namely, (a) pass time and (b) benefits, which included companionship and anonymity reasons.

Toffler and Toffler (2006) remark that information and communication carry the potential to fundamentally alter our political, social, and economic relations in an age marked as the Third Wave. In addition they note, that information is a nondiminishing resource; that is, although industrial "rival good" like steel are used up when consumed, information is a nonrival good that can remain with senders and receiver

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Research on IT/IS Evaluation: A 25 Year Review

Xingchen Song and Nick Letch

UWA Business School, The University of Western Australia, Perth, Australia

songx02@student.uwa.edu.au

nick.lecth@uwa.edu.au

Abstract: The conduct of IT/IS evaluation and its associated approaches, techniques and methods have been the subject of IS research for many years, particularly in the last two decades. This paper reflects on the body of knowledge which has emerged over the past twenty-five years in order to identify where research efforts are focussed, what are the important issues in IT/IS evaluation research, and where future research efforts should be placed. This study presents a descriptive analysis of research on IT/IS evaluation over the last 25 five years, from 1986 to 2010, in five leading IS journals. In total, 176 papers related to IT/IS evaluation are identified and reviewed in this study. Based on the Context, Content and Process model, IT/IS evaluation can be broken down to five interrelated elements: *why* evaluation is carried out, *what* is evaluated, *when* evaluation takes place, *how* evaluation is performed and *who* is involved in evaluation. Each of these elements are identified and classified in the sample research articles and based on this analysis, we propose a new perspective for classifying IT/IS evaluation approaches.

Keywords: IT/IS evaluation, literature review; Content, Context and Process (CCP) model, evaluation streams

1. Introduction

It is widely accepted that the application of information and communications technology has become critical to the success of business (Willcocks & Lester 1996). While there has been worldwide increasing expenditure on IT/IS over the past few decades (Ballantine & Stray 1999, Serafeimidis & Smithson 1999, Willcocks & Lester 1996), it is recognised that the successful deployment of IT/IS does not occur by default. On the contrary, it has been widely noted that a mismatch exists between the outcomes delivered and the benefits that are promised. This is often cited as the “productivity paradox” (Irani & Love 2008, Farbey et al. 1999c, Willcocks & Lester 1996). A perennial managerial task for organisations is therefore to be able to effectively evaluate the contribution of investments in information and communications technology. Given the importance of effective evaluation to managers, this paper reviews the research literature on IT/IS evaluation has developed over the past twenty-five years.

Evaluation is a process used to identify, measure, and assess the value of an object in a given context. Evaluation processes play a critical role in organisations’ efforts to assess the success and payoffs of their investments in IT/IS. Consequently, in the research literature there have been extensive efforts to understand the nature of IT/IS evaluation and to develop improved approaches and techniques. Given that IT/IS evaluation has been an important and ongoing of domain of research interest, it is worth reflecting on how research in the area has evolved. Peer reviewed journals in the information systems discipline are, in theory, representations of current thinking and theoretical development. In order to understand the changes in development in thinking with respect to IIT/IS evaluation, this study conducts a rigorous, quantitative review of IT/IS evaluation literature in five leading IS journals over the last 25 years. As a starting point for our analysis we adopt the approach taken by Serafeimidis (2002) who briefly reviewed research on IS evaluation based on the concepts embodied in the Content, Context and Process (CCP) model. His analysis elaborated three different streams of IT/IS evaluation: the technical/functional stream, the economic/financial stream and the interpretive stream. Our aim is to update Serafeimidis’ study and further enhance the understanding of the three evaluation streams.

In the remaining sections of this paper, the framework that we use for analysis – the Content, Context and Process model – is first described followed by an outline of the research methodology and the analytical approach adopted. The data representing the published IT/IS research on evaluation is then analysed in accordance with the CCP model. The final sections of the paper discuss the findings of the analysis and show how the comprehensive analysis over 25 years provides an alternative classification to Serfieimidis’ categories of research. Through a discussion of the critical features of

relationships between each stream of IT/IS evaluation research identified, we then suggest directions for future research in the domain.

2. Understanding IT/IS Evaluation Research– The Content, Context and Process (CCP) Model

IT/IS evaluation is a multifaceted and complicated phenomenon which can be examined from multiple perspectives. As a domain of study it can be considered to be an interactive social system that is interwoven with different stakeholders, various resources and multiple decision-making processes (Irani & Love 2008, Farbey et al. 1999b). It is possible for example to examine the variety of techniques that can be applied during evaluation, the activities and processes involved in evaluation, as well as the layers of political motivations that drive the conduct of evaluations. In order to capture the breadth of research conducted in IT/IS evaluation we use a recognised and well-structured framework, (Irani & Love 2008, Farbey et al. 1999b), namely, the Content Context and Process (CCP) model. This model was first introduced to IT/IS evaluation research to investigate and analyse important elements in an IT/IS evaluation by Symons (1991). Subsequently, the CCP model has been successfully applied in several IT/IS evaluation studies (Huerta & Sanchez 1999, Avgerou 1995, Serafeimidis 2002, Stockdale & Standing 2006, Serafeimidis & Smithson 1999). In one such study, Serafeimidis (2002) conducted a brief review of research on IT/IS evaluation based on the concepts of CCP in order to draw out the themes of study in IT/IS evaluation. This work was valuable in orienting the focus of research at that time and the study described in this paper aims to extend this work with a further application of the CCP model as the framework for analysis.

In the CCP model, the *Context* dimension aims to capture *why* evaluation is carried out and *who* is involved in the evaluation. Context refers to both the internal and external environment of an organization (Avgerou 1995). Internally, it includes aspects such as the structure, business strategies, management procedures, and culture of an organization. Externally, it includes factors like technologies, market structures, and government policies. In each specific context, IT systems are designed and implemented to serve different purposes, to fulfil various requirements and deliver diverse benefits. The context dimension of the CCP model captures the internal and external context by assessing the underlying motivations for conducting evaluations and an exploration of the various stakeholders involved.

The *Content* dimension of the model is concerned with the subject/object of evaluation, the criteria that are used to assess the IT/IS, and any changes caused by the IS (Avgerou 1995). That is, this dimension addresses questions of *what* is being evaluated? Serafeimidis' study suggested that efficiency and effectiveness measures have been the most frequently applied criteria (Serafeimidis 2002) to evaluating the content dimension and in addition, this dimension is closely related to the context in which evaluation is carried out.

The third dimension of the CCP framework - the *process* dimension focuses on questions of *when* evaluation takes place, and how evaluation is performed. In the framework, process refers to the actions, reactions, and interactions of the interested parties involved in the IT/IS evaluation. Again there is a strong relationship between this dimension and the content dimension of evaluation (Serafeimidis & Smithson 2000). In addition to the method of evaluation, the timeframe in which the evaluation occurs is also a critical issue. For instance Farbey (1992) suggests that evaluation can take place either at a point in time or it may be conducted continuously across the lifecycle of an IT/IS implementation.

Other frameworks or models are found in the literature for understanding IT/IS evaluation or implementation (Özkan et al. 2007, Farbey et al. 1999a), but the CCP model is applied in this research for understanding and discussion of evaluation for two reasons. First, there is a wide acceptance of the CCP model among leading contributors to IT/IS evaluation theory. Efforts of conducting or promoting CCP can not only be found in IT/IS research (Huerta & Sanchez 1999, Symons 1991, Avgerou 1995, Serafeimidis 2002, Stockdale & Standing 2006, Serafeimidis & Smithson 1999), but also other topics, such as organizational performance (Ketchen et al. 1996), openness to organizational change (Devos et al. 2007), and marketing strategies (Baines & Lynch 2005).

Secondly, the concepts contained within CCP are broad enough to accommodate the myriad ideas and arguments in this well-documented field, while still providing parameters for reviewing them

(Stockdale & Standing 2006). The CCP model breaks evaluation into a number of elements: purpose (why), the subject and criteria (what), timeframe (when), methodologies (how) and people (who). By doing so, the CCP model allows for the recognition of a wide scope of interrelated factors that need to be taken into account in an effective evaluation (Stockdale & Standing 2006, Serafeimidis 2002).

3. Research Method and Data Collection

In order to investigate the evolution of research in IT/IS evaluation, we examine research published in five premier IS journals spanning the period 1986-2010. Journal papers were selected as the source of data because by nature of their review and editorial processes they exhibit a higher reliability than other resources such as working papers, dissertations and conference proceedings. In total, 176 studies published in *European Journal of Information Systems (EJIS)*, *Information Systems Research (ISR)*, *Journal of Information Technology (JIT)*, *MIS Quarterly (MISQ)* and *Journal of Management Information Systems (JMIS)* related to IT/IS evaluation were identified and included in this study. The five particular journals were selected because of their consistently high reputation and ranking across a range of indicators. Each of these journals for example are ranked as A* publications in the Australian Business Deans Council journal rankings as well as the Association of Information Systems Senior Scholars basket of journals.

In selecting papers from the journals, IT/IS evaluation papers were chosen according to keywords identified in the title and abstract. This approach therefore focussed analysis on those papers that included IT/IS evaluation as a primary subject of the article. For each paper reviewed, the purpose of the study, the organization sector in which the study was conducted, the unit of analysis and the research methodology were identified. This general analysis provided an overall perspective of the trajectory that IT/IS evaluation research has taken over the last 25 years.

For a more detailed analysis of IT/IS evaluation, concepts related to IT/IS evaluation in each paper were identified and categorized according to the underlying questions of the dimensions defined by the CCP model. Previous research has yet to identify a clear and comprehensive analysis of the purpose of evaluation. Therefore our analysis of understanding the question of *why* evaluation is conducted uses a grounded approach and relevant concepts are abstracted from each article and then categorised. To assess the content dimension of evaluation where the focus is on questions of *what* is being evaluated, our analysis was guided by the measures inherent in the DeLone and McLean IS success model (DeLone and McLean 1992, 2003) because of its wide acceptance and recognition in the IS research field. To assess the important temporal dimension of evaluation we draw on Farbey's (1992) definition of IT/IS evaluation and abstract the evaluation timeframes identified and discussed in each of the papers. The classification used by Serafeimidis' (2002) study in identifying the methodologies, tools and approaches to evaluation, was used to assess *how* evaluation is performed. For questions of *who* was involved in evaluation which is important in assessing the context dimension of the CCP model, major players were identified directly from each paper and then categorised.

4. Data Analysis

An overview of the IT/IS evaluation research articles examined are provided in table 11 below. As can be seen, there was an increase in the number of published evaluation studies from late 1980s to early 2000s with a sharp decrease in the period 2006-2010. One possible reason for this decline is that IT/IS evaluation has more recently been seen as being embedded with broader managerial issues in IT/IS implementation (Irani & Love 2008, Huerta & Sanchez 1999). From our analysis of articles published in our journal sample, a large number of studies discussed concepts of IT/IS evaluation, but were not primarily focussed on evaluation per se. Therefore, these studies were not included in this review.

There was an almost even distribution of the number of papers across all journals. *MISQ* and *JMIS* had relatively more due to their longer publication history relative to the other journals. Most papers in the period 1986 to 1990 were published in these two journals whereas *EJIS* and *ISR* were first published in early 1990s. It was found that *JIT* had less focused on IT/IS evaluation compared to the other journals sampled.

Table 1. Papers Distribution by Journals and Years

	EJIS	ISR	JIT	MISQ	JMIS	Total
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1986-1990	0	1	5	6	8	20 (11.4%)
1991-1995	4	3	9	14	9	39 (22.2%)
1996-2000	5	6	9	11	14	45 (25.6%)
2001-2005	10	14	5	6	14	49 (27.8%)
2006-2010	10	4	1	3	5	23 (13.1%)
Total	29 (16.5%)	28 (15.9%)	29 (16.5%)	40 (22.7%)	50 (28.4%)	176 (100%)

depict the research purpose, context, unit of analysis and research methods of paper reviewed by different journals and periods. For each of the papers analysed we aimed to identify the underlying research purpose in order to understand the objectives of each article. Six purposes were identified in this study:

Instrument/method development: these studies consider that evaluation tools or methods in use are either problematic or unable to fit into a specific context. Therefore, researchers attempted to develop new or modify current evaluation instrument or methods, either practically or theoretically.

Instrument/method validation: these studies examine the validity and reliability of the instruments and methods proposed in previous studies (not limited to 176 papers reviewed), and serves as an external validation.

Construct/measurement development: these studies attempt to develop evaluation criteria in a certain context or environment. About 22.2% papers studied serve this purpose.

Construct/measurement validation: these studies can be considered as external validation of constructs or measurements proposed by other studies and further examine their validity and reliability.

Study of evaluation practice: these studies analyze actual evaluation practices and report important finding(s) from them.

Carrying out an evaluation: in this group of studies, the authors are the ones who actually conduct the evaluation. They then report their evaluation process, outcomes and findings.

In general, a large portion of the studies focused on the development of evaluation instruments/methods (43.2%) and construct/measurement (22.2%) (see Table 2). However, relatively fewer studies further examined the reliability and validity of the instruments/methods developed (11.9%) or the constructs/measurement (5.1%) as an external validation. In addition, a number of articles examined completed evaluations in practice (12.5%), but only a few carried out an actual in-situ evaluation and reported on that process and the findings (5.1%). This finding was reflected in each journal separately. Most papers focused on instrument and construct development, but only a few efforts were put into other aspects. Nevertheless, JIT showed a special interest in study of evaluation practice. Moreover, the general trend did not change much over the years (see Table 3).

Table 2. Features of the Papers by Journals

		EJIS	ISR	JIT	MISQ	JMIS	Total
Research Purpose	Instrument/method development	12 (41%)	12 (43%)	9 (31%)	18 (45%)	25 (50%)	76 (43.2%)
	Instrument/method validation	3 (10%)	2 (7%)	0 (0%)	9 (23%)	7 (14%)	21 (11.9%)
	Construct/measurement development	6 (21%)	12 (43%)	6 (21%)	5 (13%)	10 (20%)	39 (22.2%)

	Construct/measurement validation	1 (3%)	0 (0%)	1 (3%)	4 (10%)	3 (6%)	9 (5.1%)
	Study of evaluation practice	5 (17%)	0 (0%)	11 (38%)	3 (8%)	3 (6%)	22 (12.5%)
	Carrying out an evaluation	2 (7%)	2 (7%)	2 (7%)	1 (3%)	2 (4%)	9 (5.1%)
Context	General	13 (45%)	13 (46%)	10 (34%)	17 (43%)	27 (54%)	80 (45.5%)
	Private	11 (38%)	14 (50%)	17 (59%)	23 (57%)	18 (36%)	83 (47.2%)
	Public	5 (17%)	1 (4%)	2 (7%)	0 (0%)	5 (10%)	13 (7.4%)
Unit of Analysis	IT	9 (31%)	11 (39%)	5 (17%)	12 (30%)	22 (44%)	59 (33.5%)
	IS	11 (38%)	11 (39%)	9 (31%)	17 (43%)	15 (30%)	63 (35.8%)
	Both	3 (10%)	1 (4%)	2 (7%)	7 (18%)	2 (4%)	15 (8.5%)
	IT/IS investment	6 (21%)	5 (18%)	13 (45%)	4 (10%)	11 (22%)	39 (22.2%)
Research Methods	Survey	5 (17%)	7 (25%)	7 (24%)	18 (45%)	15 (30%)	52 (29.5%)
	Case study and qualitative	12 (41%)	2 (7%)	12 (41%)	11 (28%)	16 (32%)	53 (30.1%)
	Concept description	8 (28%)	3 (11%)	5 (17%)	2 (5%)	9 (18%)	27 (15.3%)
	Secondary data (literature review)	1 (3%)	10 (36%)	4 (14%)	4 (10%)	8 (16%)	27 (15.3%)
	Experiments	1 (3%)	3 (11%)	0 (0%)	2 (5%)	2 (4%)	8 (4.5%)
	Combined methods	2 (7%)	3 (11%)	1 (3%)	3 (8%)	0 (0%)	9 (5.1%)

According to the CCP model, context determines the reason for an evaluation which then further influences the evaluation content and process (Stockdale & Standing, 2006). Therefore, evaluation cannot be understood in isolation from its context (Symons, 1991). A large proportion of the research reviewed was focussed on the *general context* (45.5%), in which researchers did not or were unable to distinguish the differences between public and private organisations. About 47.2% of the studies conducted in a *private context*. Very few of them specifically targeted at the IT/IS evaluation in the *public sector* (7.4%). One important change over the last 25 years was an increasing proportion of papers related to the public sector, as shown in Table 3. This implies an increasing interest in IT/IS evaluation in public organizations including hospitals and government agencies in which management need to be accountable to the taxpaying public.

Table 3. Features of the Papers by Years

		1986-1990	1991-1995	1996-2000	2001-2005	2006-2010	Total
Research Purpose	Instrument/method development	10 (50%)	18 (46%)	16 (36%)	22 (45%)	10 (43%)	76 (43.2%)
	Instrument/method validation	2 (10%)	3 (8%)	8 (18%)	5 (10%)	3 (13%)	21 (11.9%)
	Construct/measurement development	4 (20%)	5 (13%)	11 (24%)	13 (27%)	6 (26%)	39 (22.2%)
	Construct/measurement validation	0 (0%)	6 (15%)	1 (2%)	1 (2%)	1 (4%)	9 (5.1%)
	Study of evaluation practice	4 (20%)	4 (10%)	8 (18%)	6 (12%)	0 (0%)	22 (12.5%)

	Carrying out an evaluation	0 (0%)	3 (8%)	1 (2%)	2 (4%)	3 (13%)	9 (5.1%)
Context	General	7 (35%)	21 (54%)	21 (47%)	22 (45%)	9 (39%)	80 (45.5%)
	Private	13 (65%)	17 (44%)	21 (47%)	23 (47%)	9 (39%)	83 (47.2%)
	Public	0 (0%)	1 (3%)	3 (7%)	4 (8%)	5 (22%)	13 (7.4%)
Unit of Analysis	IT	4 (20%)	8 (21%)	15 (33%)	21 (43%)	11 (48%)	59 (33.5%)
	IS	9 (45%)	18 (46%)	15 (33%)	14 (29%)	7 (30%)	63 (35.8%)
	Both	2 (10%)	5 (13%)	2 (4%)	5 (10%)	1 (4%)	15 (8.5%)
	IT/IS investment	5 (25%)	8 (21%)	13 (29%)	9 (18%)	4 (17%)	39 (22.2%)
Research Methods	Survey	5 (25%)	11 (28%)	9 (20%)	20 (41%)	7 (30%)	52 (29.5%)
	Case study and qualitative	8 (40%)	13 (33%)	16 (36%)	8 (16%)	8 (35%)	53 (30.1%)
	Concept description	2 (10%)	10 (26%)	4 (9%)	7 (14%)	4 (17%)	27 (15.3%)
	Secondary data (literature review)	2 (10%)	2 (5%)	11 (24%)	20 (20%)	2 (9%)	27 (15.3%)
	Experiments	2 (10%)	3 (8%)	1 (2%)	1 (2%)	1 (4%)	8 (4.5%)
	Combined methods	1 (5%)	0 (0%)	4 (9%)	3 (6%)	1 (4%)	9 (5.1%)

We make a distinction between the concepts of IT and IS as the unit of analysis in evaluation, with the emphasis of IT evaluation being focussed on the objective characteristics of hardware and software deployment (Nagm 2008) as opposed to evaluation of IS in which the technologies are evaluated in the context of the wider business processes and activities in which they are embedded (Ammenwerth et al. 2003). Some research also discussed *both* IT and IS evaluation or did not make a distinction between the concepts. Moreover, some research focused on the evaluation of *IT/IS investment* rather than the IT/IS projects themselves. In total, 33.5% of the studies clearly stated their units of analysis to be the evaluation of IT and 35.8% focused on IS. In addition, a noticeable number of studies (22.2%) focused on the evaluation of investment in IT/IS rather than the IT/IS projects themselves, and fewer discussed IT or IS evaluation in general without a distinction. In terms of different journals, EJIS and MISQ were slightly more oriented to IS, and JMIS seemed to be more focused on IT. JIT on the other hand published a greater proportion of articles related to IT/IS investment. In term of the changes over time, it was interesting to notice that the evaluation of IT increased in the last 25 years, whereas papers investigating IS evaluation decreased. One possible reason for this is that when considering IT/IS evaluation, the concepts of IT, IS and IT/IS investment were often mixed and it was not possible to clearly differentiate an emphasis on IT, IS or IT/IS investment.

In relation to the research methods that were used in the analysed studies, surveys (29.5%) and case studies (30.1%) were the most frequently used approaches. The theoretical or logical development of concepts (15.3%) and secondary data (15.3%) including analyses literatures were also widely employed methods in IT/IS evaluation research. Only a few studies used experiments (4.5%) or combined methods (5.1%). Different journals tended to have preferred research methods. For instance, EJIS had more papers using concept description than average, ISR preferred using secondary data, JIT used case studies and other qualitative methods more often and MISQ used more surveys. No specific findings were found when considering research methods in different years.

4.1 Conceptualization of Evaluation Research using Content, Context and Process Dimensions

As noted previously, the CCP model lends itself to addressing a series of questions in relation to IT/IS evaluation. That is, by asking "*why, what, how, when and who*" in relation to IT/IS evaluation, the three dimensions of content, context and process can be assessed. The following analysis addresses each of these questions in relation to the sample research articles examined.

4.1.1 Why evaluation is carried out

Evaluation can serve a number of purposes. Serafeimidis (2002) addressed the usefulness of evaluation in his review of IT/IS evaluation literature, and found the major purposes or reasons for an evaluation were related to efficiency in terms of technical performance and control of resources; a desire to achieve predetermined outcomes. Our research however finds that the reasons for evaluation go beyond Serafeimidis' findings. Furthermore, previous research provides only a limited perspective of the underlying purpose of evaluation. Our findings suggest that evaluation purpose can be delineated into three categories: conceptual purpose, instrumental purpose, and political purpose. Conceptual purpose (21.0%) refers to evaluations that are carried out to discover and understand issues related to IT/IS implementation. This purpose for evaluation primarily enables understanding of IT/IS value (14.2%) to the organisation to be identified. This includes not only the identification of the benefits, costs or risks of IT/IS (10.8%), but also the appraisal of such value (3.4%). Evaluation can also improve the understanding of the performance or problems related to IT/IS projects (3.4%), as well as the use of such projects (2.8%). In addition, a few researchers also suggested that evaluation could improve the understanding of other issues (1.7%), such as stakeholders' interests. Instrumental purpose (38.6%) refers to the decisions made or actions that are taken based on evaluation. Information generated from evaluation can be used for IT/IS project planning (13.64%), including resource control, alternative prioritization, IT/IS investment decisions and system deployment. Further, effective using evaluation findings is believed to be able to improve IT/IS usage (4.55%) and organizations' business/management process (7.39%). Political purpose (1.1%) refers to the political impacts of evaluation on people involved, including user acceptance/resistance of the project, empowerment of stakeholders, gaining commitment and improved communication or discourse among stakeholders. However, there was little evidence of such a purpose found in this study. A number of articles were found with mixed purposes to conduct an evaluation (8.0%). Despite the various roles evaluation played in an organisation, a noticeable portion of research did not specify the purpose to carry out an evaluation (31.3%).

4.1.2 What is evaluated

DeLone and McLean's IS Success Model (1992, 2003) identifies definitions of IS success and their corresponding measures, and classifies them into six major categories: Information Quality, System Quality, Service Quality, System Use, User Satisfaction and Net Benefits. IT/IS business value (35.8%) is the most frequently cited consideration in evaluation, including strategic (2.3%), tactical (1.1%) and operational (20.5%) values. A specific classification of those values is provided by Irani et al (2005). Comparing to system (7.4%) and service (7.4%) quality, information or system outputs (3.0%) receives a lower attention. Large efforts has also been put into the examination of IT/IS use (9.1%) and user satisfaction (8.0%). Moreover, some research has mixed focuses (11.9%), while a number of researchers argued that the content of evaluation should be context based (9.1%).

Table4: WHY evaluation is carried out?

WHY evaluation is carried out?		Number (%)	
Conceptual Purpose*	IT/IS Value	25 (14.2%)	In total 37 (21.0%)
	Identification of the value	19 (10.8%)	
	Appraisal of the value	6 (3.4%)	
	IT/IS Project	6 (3.4%)	
	IT/IS Use	5 (2.8%)	
	Other	3 (1.7%)	
Instrumental Purpose*	-IT/IS planning and implementation	24 (13.6%)	In total 68 (38.6%)
	-Decision making	17 (9.7%)	
	-Improved IT/IS Usage	8 (4.6%)	
	-Improved management & business	13 (7.4%)	
	-Other	8 (4.6%)	
	Benefits realisation	4 (2.3%)	
	Improved IT/IS service	2 (1.1%)	
Benchmarking	2 (1.7%)		
Political Purpose		2 (1.1%)	
mixed		14 (8.0%)	
Not discussed and specified		55 (31.3%)	

* indicates an overlap

Table 5.WHAT is evaluated?

WHAT is evaluated?	Number (%)
IT/IS value	63 (35.8%)
Strategic Value	4 (2.3%)
Tactical Value	2 (1.1%)
Operational Value	36 (20.5%)
Mixed	21 (11.9%)
System quality	13 (7.4%)
Outputs quality	7 (3.0%)
Service quality	13 (7.4%)
IT/IS use	16 (9.1%)
User satisfaction	14 (8.0%)
Context based	16 (9.1%)
Mixed	21 (11.9%)
Not discussed or specified	13 (7.9%)

4.1.3 When is evaluation carried out

According to Farbey et al. (1992), evaluation can take place either at the specific point of time or continuously through the system development life cycle. The former includes both evaluation conducted before the implementation or ex-ante (18.8%), and after the implementation or ex-post (59.7%). The later suggested evaluation is an ongoing process, and it can be carried out at various stages (8.5%) in the IT/IS development and implementation. In our sample, 11.4% of articles do not specify when evaluation should take place.

Table 6.WHEN evaluation takes place?

WHEN evaluation takes place?	Number (%)
ex-ante	33 (18.8%)
ex-post	105 (59.7%)
ongoing/various stages	15 (8.5%)
Not discussed or specified	20 (11.4%)

4.1.4 How evaluation is performed

Serafeimidis (2002) identified and categorised a number of evaluation methods and tools in his study. In assessing the IT/IS value to business, finance (11.4%) and economic (19.9%) based techniques, such as Net Present Value (NPV), Return on Investment (ROI) and Cost-Benefits Analysis (CBA) are the most frequently reported or studied methods in the articles reviewed. Behaviour driven (21.0%) methods, such as SERVQUAL (Van Dyke et al. 1997), are the major method carried out to understand IT/IS use and user satisfaction. A number of survey instruments (10.2%) are developed for understanding IT impacts. Technical standards (6.8%) are used to assess IT/IS system quality, including software metrics and outcome comparison methods. A few studies discussed mixed methods in evaluation (4.5%), and other 6.3% of authors argued the method selected should depend on the context. A significant number of the articles did not specify the evaluation methods (19.9%).

4.1.5 Who is involved in evaluation

Evaluation is a process that different people involved to either provide or analyse information related to IT/IS. Almost half of the papers reviewed (47.7%) does not specify clearly who should be responsible for the evaluation. For the ones specified people, evaluation is majorly carried out at the senior management level, where IT staff (18.2%) and financial department (28.4%) are the major evaluators. Top management (9.7%) support is believed to be critical to an effective IT/IS evaluation. Users (36.4%) are reported to be the major stakeholders who provided information for evaluation. Only 8.0% of the research states that multiple stakeholders should be involved in evaluation rather than solely IT or finance department.

Table 7.HOW is evaluation performed?

HOW evaluation is conducted?	Number (%)
Technical standards	12 (6.8%)
Finance based	20 (11.4%)

Table 8.WHO is involved in evaluation?

WHO is involved in evaluation?	Number (%)
Senior Managers*	IT* 32 (18.2%)

Economic based	35 (19.9%)	Finance*	50 (28.4%)
Behaviour driven	37 (21.0%)	Top Manager	17 (9.7%)
Survey method	18 (10.2%)	User*	64 (36.4%)
Mixed	8 (4.5%)	Other	4 (2.3%)
Context based	11 (6.3%)	Multiple stakeholders	14 (8.0%)
Not discussed or specified	35 (19.9%)	Not discussed or specified	84 (47.7%)

* indicates an overlap

5. Discussion

5.1 A Respecification of Evaluation Streams

From this review, we have found that current IT/IS evaluation research still places excessive emphasis on the technological (e.g. software standards) and financial (e.g. discounted cash flow techniques) aspects of evaluation at the expense of the organisational and social dimensions. However, the role of IT/IS in organisations can be seen as a movement from automating to supporting decision-making, and more recently to transformation (Ballantine et al. 1996). The traditional technical/financial evaluation techniques are widely reported to be problematic and unable to cope with these changes (Serafeimidis & Smithson 1999, Irani & Love 2008, Symons 1991, Avgerou 1995). Therefore, research focusing on traditional evaluation streams contributes to one piece of the picture but is not comprehensive enough to describe the complexity of IT/IS evaluation. To overcome this problem, many researchers (e.g. Smithson & Hirschheim 1998, Symons 1991, Farbey 1999) suggest that IT/IS evaluation would be improved by “interpretive” alternatives, which take perceptions of multiple stakeholders into consideration.

The aforementioned “technical”, “financial” and “interpretive” approaches are accepted classification of IT/IS evaluation streams in IS research. . These classifications reflected different evaluation strategies and were significant in identifying and understanding issues related to IT/IS.. Serafeimidis (2002) briefly reviewed literature and investigated the important features of each stream based on the concept of CCP model. Our current study extends Serafeimidis’ work and reinforces his findings with enhancements to the current classification of IT/IS evaluation.

The technical, financial and interpretive evaluation classification streams that Serafeimidis identified indicate a clear separation between three discrete evaluation categories. However, our analysis found that “technical” factors are always embedded to some degree within a “financial” evaluation context. In addition, because it aims to understand different interests of various stakeholders, “interpretive” evaluation tends to include both “technical” and “financial” considerations to some extent. Evaluation strategies have evolved with the development of IT. The evolution of IT/IS in organizations can be seen as a movement from automating to informing, and more recently to transformation (Ballantine et al. 1996) and as the role of IT/IS has changed from one of support to one of strategic importance, the focus of evaluation has also evolved from efficiency to effectiveness, and further to understanding (Irani & Love 2008, Huerta & Sanchez 1999). Therefore, while Serafeimidis’ classification is a useful starting point for orienting understanding of approaches to IT/IS evaluation, the delineation between his categories is not as defined as these classifications suggest.

In addition, the terminology Serafeimidis used for different approaches implies its underlying evaluation content and method. For instance, “technical” evaluation indicates a focus on IT/IS system quality, and technical standards might be the major evaluation methods. However, in Serafeimidis’ (2002) discussion, technical evaluation also includes other criteria such as cost reduction and manpower savings. His financial evaluation not only focusses on IT/IS business value, but also examines IT/IS use and user satisfaction. A number of behaviour driven techniques are also included and discussed in addition to financial or economic techniques.

Based on our analysis of the literature, we believe that Serafeimidis’ classification should be revised so that classification is based on the context of the evaluation being performed. From this perspective evaluation can be viewed as *efficiency-driven* evaluation, *effectiveness-driven* evaluation, or *understanding-driven* evaluation. The terminology was derived from the underlying assumptions of evaluation identified in Serafeimidis’ (2002) review. Detail of each approach is summarized in Table 9.

Using this revised classification scheme, only 10.2% of the articles reviewed are in the efficiency-driven evaluation category and the majority of these were published prior to 1995. In contrast, most understanding-driven evaluation articles were published after 2000, representing only 11.4% of the

176 papers reviewed. Effectiveness-driven evaluation drew the most attention in the literature with 68.2% of the papers can be categorised in this group fairly evenly distributed over the 25 year period of the sampled research. A small number of articles (10.2%) provided a general discussion on issues related to IT/IS evaluation and were not classified into any of the revised streams.

This revised classification scheme overcomes the aforementioned problems of previous studies. Firstly, the terminology used clearly implies the focus of each evaluation stream. Secondly, rather than being treated as discrete categories, the relationship between the three evaluation streams is evolutionary. To be more specific, efficiency-driven evaluation implies that its focus is on the quality of the system under analysis and its direct outputs. From this perspective when managers are confident of the efficiency of evaluation of IT/IS quality, they can shift their focus to effectiveness considerations of IT/IS outcomes, impacts and IT/IS-human interactions. The effectiveness of IT/IS is the primary concern for any organization. However, various interpretations of effectiveness might be held by different stakeholders. Thus, based on the assessment of different stakeholders' interpretation of IT/IS effectiveness, *understanding-driven* evaluation includes both efficiency-driven and effectiveness-driven evaluation. This evolutionary approach to understanding IT/IS evaluation overcomes three problems faced by managers as identified in the literature. Firstly, it ameliorates their neglect of intangible, qualitative and in-direct objectives, and their inability to measure them (Serafeimidis & Smithson 1999). Secondly, it accounts for the IT/IS effects which organizations are most interested in assessing but are subject to change and traditional techniques are unable to cope with (Avgerou 1995). Thirdly, it accounts for multiple stakeholders involved within the IT/IS investment process, with their own set of objectives and expectations, a fact neglected by traditional techniques with a limited financial or technical (Irani & Love 2008, Huerta & Sanchez 1999).

Table 9. Streams of IT/IS Evaluation

Type	CCP elements and details		Number (%)
Efficiency driven	Why	To understand and improve IT/IS efficiency	18 (10.2%)
	What	IT/IS quality, outcomes quality, cost reduction, etc.	
	When	ex-ante or ex-post	
	How	Technical standards, Software metrics, Outcome comparison	
	Who	IT Department, Senior Managers, Data collected from Users	
Effectiveness driven	Why	To understand and improve IT/IS effectiveness	120 (68.2%)
	What	IT value, IT use, User satisfaction, Service quality, etc.	
	When	ex-ante or ex-post, some ongoing	
	How	Finance-based, economic-based, behaviour driven	
	Who	Top management support, Senior managers, IT and Finance department, data collected from users	
Understanding driven	Why	To improve understanding of different interests and perceptions	20 (11.4%)
	What	Stakeholder interests, mixed focuses, often dependent on the context	
	When	On-going process	
	How	Interpretive methods, often context-based	
	Who	Multiple stakeholders needed to be involved	
General	General discussion on issues related to IT/IS evaluation, e.g. the ethical issues		18 (10.2%)

5.2 Gaps in IT/IS Evaluation Research

There has been a significant amount of research on IT/IS evaluation in the last 25 years. Our review of the sample literature based on the CCP model identifies several gaps in the published literature in relation to IT/IS evaluation.

Firstly, nearly a third of all articles examined ignore the purpose of evaluation (31.3%) and nearly half did not identify stakeholders (47.7%) whereas the other dimensions were usually accounted for and rarely left out of the discussion of evaluation - only 7.9% of studies neglected content, 11.4% neglected timeframe and 19.9% neglected methods. Given that only 10.2% of papers are classified as "general discussion", the neglect of evaluation purpose and people involved is considerable. This underestimation of the importance of purpose of evaluation suggests that evaluation is frequently being used in a ritualistic manner (Nijland & Willcocks 2008). For instance, ex-ante evaluation usually is used as a means to gain project approval (Nijland & Willcocks 2008), and ex-post evaluation has been used to formally complete or sign-off the task and disengage the IT/IS department from a project (Jones 2008). Also, the neglect of people involved in evaluation suggests that researchers often fail to

take into consideration the impacts that different stakeholders have on evaluation, or alternatively, the impact of evaluation on stakeholders.

Secondly, there is an unbalanced focus in each element of evaluation in research. In terms of evaluation purpose, there appears to be little published research which reflects the political aspects of evaluation. When evaluating the value an IT/IS project, most research focuses on the operational level but underestimates its strategic and tactical value. More attention has been paid to ex-post evaluation than either ex-ante or ongoing evaluation. Traditional finance/economic based techniques and user satisfaction survey methods remain predominant approaches to evaluation. Hence, IT and finance departments tend to be the major players in evaluation and IT/IS users are the primary source of data. As a consequence, not all interested stakeholders are involved in evaluation and therefore they have little opportunity to shape further development.

Thirdly, this study indicates a mismatch between IT/IS evaluation research and practice. For instance, regarding the timeframe of IT/IS evaluation, more research pays attention to ex-post than ex-ante. Nevertheless, ex-ante evaluation is found to be more prevalent than ex-post evaluation in practice (Avgerou 1995, Nijland & Willcocks 2008, Al-Yaseen et al. 2008). Also, a large number of evaluation methods have been developed in research, but very few of them have been seen in practice. Moreover, while evaluation research is currently shifting from the efficiency and effectiveness-driven approaches to understanding-driven (Serafeimidis, 2002) and comprises various interpretive or informal evaluation methods (Avgerou 1995, Irani & Love 2008, Symons 1991), IT/IS evaluation in practice still focuses on the assessment of the efficiency and effectiveness of the system (Serafeimidis 2002, Nijland & Willcocks 2008).

6. Conclusion

This study reviewed 176 papers in five leading IT/IS research journals over the last 25 years. Concepts of evaluation in all papers were analysed based on the CCP model. Based on findings from this research, we propose that the classification of IT/IS evaluation should be respecified as an evolving continuum of efficiency-driven evaluation, effectiveness-driven evaluation, and understanding driven evaluation. We suggest that according to CCP model, people are the core of any evaluation. It is people who make decisions on what is evaluated, when evaluation takes place and how evaluation is done. Thus, the stakeholders involved in evaluation are critical to an effective evaluation. The study of human factors in evaluation also consists with the shift from traditional evaluation to understanding-driven stream. Further research can be carried out to investigate different stakeholders involvement strategies and their impacts on the evaluation process and outcomes.

This study also suggests that the evaluation can serve a number of conceptual, instrumental or political purposes. However, in practice evaluation is often carried out in an *ad hoc* or ritualistic manner. The potential usefulness of evaluation outcomes and processes is underestimated. Therefore, further research can focus on how to make the evaluation outcomes and processes effectively used.

Lastly, the mismatch between research and practice indicates a long distance from developing evaluation methods to put them in actual use. Particularly, the calls for interpretive methods seem rarely being heard by practitioners. Researchers therefore need to address the obstacles between research and practice, communicate the problems or risks of using those methods and to identify ways to promote the evaluation methods we have developed to decision makers in practice.

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