An institutional perspective on developing and implementing intranet- and internet-based information systems

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Abstract. This paper adopts a constructivist, case-based research strategy to examine the development and implementation of intranet- and internet-based information systems (IS) in a single organization. Institutional theory is used to describe, explain and understand the commitments of social actors in the development of web-based IS. The findings illustrate that: (1) social and organizational problems similar to those that beset ‘traditional’ IS development arise in the development and implementation of web-based IS; (2) ‘top-down’ development and implementation strategies give rise to more conflict and change management problems than ‘bottom-up’ approaches; and (3) fostering high levels of commitment to organizational imperatives is key to the successful development and implementation of web-based IS.

Keywords: internet, intranet, IS development, implementation, commitment, institutional theory

INTRODUCTION

The point of departure for this study is a simple question: ‘Does the development and implementation of web-based information systems (IS) give rise to the same social and organizational problems associated with the development and implementation of “traditional” IS?’ This paper illustrates that similar challenges and problems characterize the development of intranet- and internet-based IS as in the development of ‘traditional’ IS. Nevertheless, users of intranet- and internet-based IS interact with such systems in new and often different ways. Users of intranet-based IS, for example, can add, change or update content in real time; indeed, it appears that users’ commitment to keeping content up-to-date is the key postimplementation success factor for some intranet-based IS. Users of internet-based IS are increasingly afforded direct access to the internal components of a firm’s value chain, with concomitant implications for the reconfiguration of internal processes. This study posits that the key factors in the successful development, implementation and use of web-based IS are:
(1) effective management of developers’ and users’ commitments; and (2) successful alignment of such commitments with organizational imperatives. Winograd & Flores (1986) arrived at similar conclusions in relation to ‘traditional’ systems. Thus, this study argues that the fundamental nature of the IS development process has not changed with the advent of web-based technologies.

This paper is organized as follows: a theoretical framework or baseline is established by examining the factors that influence the successful development and implementation of ‘traditional’ IS. Institutional theory is then examined to illustrate how the commitments of social actors influence and shape organizational endeavours. Method is then discussed, along with the case report, which is structured using the framework. The paper concludes by drawing on the empirical findings to highlight the similarities between the problems in developing and implementing web-based IS and those of ‘traditional’ IS.

WEB-BASED AND ‘TRADITIONAL’ INFORMATION SYSTEMS DEVELOPMENT

While there is a vast body of research on ‘traditional’ IS development, recent studies on the design and implementation of web-based IS generally argue that this is a relatively new phenomenon, posing novel challenges for developers and users. This section provides an overview of these issues.

Researchers argue that web-based technologies constitute new media for human communication; consequently, they offer the capability to create new types of IS (Turoff & Hiltz, 1998) that cover all aspects of the organizational value chain (Isakowitz et al., 1998). The number of organizations that employ such technologies has grown significantly (Kalakota & Robinson, 1999), with intranets increasingly being employed worldwide (McNaughton et al., 1999; Alavi & Leidner, 2001). There is, however, a paucity of rigorous, in-depth research on the social and organizational issues surrounding the development and implementation of web-based IS. In addition, published studies have, generally, ignored the lessons learned from research on ‘traditional’ systems development.

Several researchers have indicated that new development strategies and approaches need to be adopted for research on web-based IS (Damsgaard & Scheepers, 2000; Carstensen & Vogelsang, 2001; Karlsbjerg & Damsgaard, 2001). Such researchers argue that web-based IS leads to greater internal integration and external extension of the value chain and new development and implementation issues. However, the trend towards informatizing and automating the value chain using information technology (IT) began in the late 1980s with electronic data exchange, mobile computing, local-area network (LAN) and wide-area network (WAN) technologies, process re-engineering and similar innovations. In addition, end-user computing began in the 1980s with the advent of the PC – end-user exploitation of web-based technologies to facilitate corporate learning is the logical extension of this trend. Perhaps this is why Phelps & Mok (1999) conclude that the successful implementation of intranet-based IS can be largely explained by standard determinants of IS success. But what are the ‘standard’ determinants of IS success?
To answer this question and that posed earlier, it is necessary to establish a basis for comparison by reporting on the problems that beset the development of ‘traditional’ IS. Table 1 employs Bruner’s (1990) ‘Burkean Pentad’ to develop a framework that examines the issues which characterize ‘traditional’ IS development. Narratives describing IS development typically include some or all of the various ingredients/elements/issues highlighted. Bruner (1990) draws on Burke (1945) to illustrate the structure, form and content of social narratives. He argues that narratives, like dramas, possess five basic ingredients or dimensions, namely, an agent, a purpose, a scene, an agency and an act or actions – these constitute the ‘Burkean Pentad’. Bruner argues that social narratives can be usefully analysed and understood using this Pentad as an analytic framework.

IS development may be conceptualized as a social drama that is given expression in narrative form by participating social agents or actors – that is, business and IS managers, developers, users and other stakeholders – and ultimately, by researchers. The texts of such narratives highlight the complexity of the problems facing involved actors, and the approaches they adopt in ‘making sense’ of these complex situations. Actions described in the narratives possess a purpose toward a particular end. The scene in which the action occurs is typically noted in detail with the ‘roles’ of supporters and protagonists clearly delineated. Agency involves the use of tried and tested problem-solving routines (e.g. the means, i.e. the various policies, methods, techniques and tools employed to achieve development ends).

The problems dimension in Table 1 focuses on those factors that impede the successful development of ‘traditional’ IS; however, Butler & Fitzgerald (2001) argue that success is a nebulous concept, as researchers have previously employed surrogates to measure the success of development outcomes. For example, user satisfaction with developed systems is widely

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**Table 1. Characteristic ingredients of ‘traditional’ information systems (IS) development narratives**

<table>
<thead>
<tr>
<th>Narrative ingredient</th>
<th>Description</th>
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<tbody>
<tr>
<td>Scene</td>
<td>Organizational and institutional contexts: external environment, organizational environment, IS development environment (Ives et al., 1980).</td>
</tr>
<tr>
<td>Actors</td>
<td>Business and IS managers, developers, end-users, organizational stakeholders, consultants, customers (Cavaye, 1995)</td>
</tr>
<tr>
<td>Purpose</td>
<td>Organizational/system level – automate and/or informate; group/individual level – commitments to particular ends (Zuboff, 1988).</td>
</tr>
<tr>
<td>Actions</td>
<td>Systems analysis, design, detailed design, implementation, prototyping, project management, change management (Keen, 1981; Yourdon, 1989).</td>
</tr>
<tr>
<td>Agency</td>
<td>Project management techniques, IS development methods, CASE-tools, business rules and policies, organizational policies around IS development (Aaen, 1986; Sumner &amp; Ryan, 1994).</td>
</tr>
<tr>
<td>Problems</td>
<td>Inadequate project estimation, planning, co-ordination and control of project; not spending adequate time on requirements analysis; absence of user representation/participation; absence of top management commitment; failure to resolve change management issues and political conflict; low levels of inter- and intraproject communication between the various project participants/stakeholders/constituencies; failure by developers to appreciate or understand business issues/business perspectives; inappropriate and/or misaligned developer and user commitments (Sumner &amp; Ryan, 1994; Cavaye, 1995; Butler &amp; Fitzgerald, 1999).</td>
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employed to measure system success (Cavaye, 1995). Such studies illustrate that participation leads to greater user satisfaction by: (1) developing realistic expectations about system capabilities; (2) providing an arena for bargaining and conflict resolution about design issues; (3) facilitating system ownership by users; (4) decreasing user resistance to change; and (5) committing users to the system (Cavaye, 1995). The question here is ‘Can the same be said of intranet- and internet-based IS development?’

**COMMITMENT AS A THEORY OF BEHAVIOUR IN INSTITUTIONAL CONTEXTS**

Institutional theory has been employed by IS researchers to examine the development, implementation and use of ‘traditional’ and web-based IS (King *et al*., 1994; Butler & Murphy, 1999; Damsgaard & Scheepers, 1999). This paper builds on such research and, following Winograd & Flores (1986), employs Selznick’s (1949; 1957) theory of commitment to help explain and understand institutional influences surrounding the development and implementation of web-based IS.

In describing the role of commitment in organizations, Selznick (1949, pp. 258–259) argues that:

The systematized commitments of an organisation define its character. Day-to-day decision, relevant to the actual problems met in the translation of policy into action, create precedents, alliances, effective symbols, and personal loyalties which transform the organisation from a profane, manipulable instrument into something having a sacred status and thus resistant to treatment simply as a means to some external goal.

A ‘commitment’ is an ‘enforced’ component of social action: it refers to the binding of an individual to particular behavioural acts in pursuit of organizational objectives. Selznick (1949) delineates several types of commitment:

- **Commitments enforced by uniquely organizational imperatives:** These are usually implemented by policy decisions associated with system maintenance; consequently, they ensure that organizational requirements of order, discipline, unity, defense and consent are fulfilled.

- **Commitments enforced by the social character of the personnel:** Social actors possess particular needs, levels of aspiration, training and education, social ideals and class interest; thus, influences from the external environment shape the commitments of organizational actors.

- **Commitments enforced by institutionalization:** An organization’s goals, policies or procedures achieve an established, value-impregnated status, which restrict choice by enforcing commitment to behavioural standards.

- **Commitments enforced by the social and cultural environment:** Organizational policies and outcomes are often influenced and shaped by social actors in the external social and cultural environment.
• Commitments enforced by the centres of interest generated in the course of action: Sectional interests influence the formulation of policies and programmes in unintended ways; such unaligned commitments can lead to suboptimal outcomes.

It is clear from Selznick that the locus of commitment and its enforcement varies from the individual in certain circumstances, to social groupings, to the organization of which they are members and to external agencies (Burns, 1963). While Selznick (1949) employs the term 'enforced' to indicate the mechanisms by which 'commitment' is operationalized in organizational contexts, enforcement does not necessarily imply that social actors are at all times compelled by coercive rule-based organizational dictate to adopt desired behavioural patterns in the pursuance of organizational objectives. As Scott (1995) illustrates, normative and cognitive mechanisms are also at play. Hence, a mixture of 'coercive' (regulative), 'mimetic' (cognitive) and 'normative' influences act to socially construct an organization (DiMaggio & Powell, 1991).

Intentional mental states are the primordial source of commitment, whatever the origin of the social forces that contribute to their formation. That said, Kanter (1968) shows that institutional factors, be they formal rule-based organs of the institution or less formal normative and cognitive social mechanisms, operate through role-based activities to compel or bind actors to adopt particular behaviours, by operating on their intentional states or purposeful activities. Accordingly, Bruner (1990) argues that while beliefs guide social action, being compelled to act in a particular way can also help shape and influence belief; thus as with belief and action, the relationships between speech acts and the commitments of social actors are reciprocal (Winston & Flores, 1986).

A CONSTRUCTIVIST RESEARCH APPROACH

The fundamental perspective of constructivist philosophy posits that reality is socially constructed (Berger & Luckmann, 1967). The social and institutional processes surrounding the development and implementation of IS is one such reality (Vissia, 1991). Research into social phenomena should be interpretivist in orientation so that contextualized meaning can be revealed in order to enable socially based phenomena to be understood (Lincoln & Guba, 1985). This paper is informed by Guba & Lincoln's (1994) constructivist research paradigm; accordingly, it employs a hermeneutic method in conjunction with the qualitative research techniques advocated by the constructivist paradigm (Butler, 1998).

Hermeneutics is the philosophy of the interpretation of meaning (Bleicher, 1980). Interpretation involves entering into the interpretative norms of a community, while meaning here operates within the historical contexts of the interpreter and the interpreted (Gadamer, 1975; Butler, 1998). While Guba & Lincoln (1994) advocate the use of the hermeneutic method, they fail to offer a description of an interpretive research method that draws on the tenets of hermeneutic philosophy. This study applies the hermeneutic method articulated by Butler (1998), which incorporates the hermeneutic 'circle of understanding' and the Socratic, Hegelian and Reductionist/Analytical dialectics as its prime methodological techniques. In addition, Butler's (1998)
adaptation of Madison’s (1988) interpretive principles informs the conduct of the research and data analysis. While Madison’s (1988, p. 28) interpretive principles informs the interpretive process, and ensures the rigour of the researcher’s interpretations by guaranteeing that ‘the judgements arrived at [were] not gratuitous or the result of subjective whim’, Lincoln & Guba’s (1985) concepts of credibility, transferability, dependability and confirmability are applied to provide an ‘objective’ evaluation of the research product and its trustworthiness.

In keeping with prescriptions of the constructivist paradigm, and the hermeneutic method it employs, a qualitative, interpretive and case-based research strategy was adopted. This involved a single instrumental case study (Stake, 1994) undertaken to obtain an understanding of the creation, development and application of internet and intranet technologies in Analog Devices Inc. Purposeful sampling was employed throughout (Patton, 1990). The case design used is described by Yin (1989) as ‘post hoc longitudinal research’.

Research in Analog Devices took place at three sites in Limerick (Ireland), Wilmington (Boston, MA) and the corporate headquarters in Norwood (MA) in August and October 1998. Fourteen taped interviews were made with a cross-section of actors from relevant ‘communities-of-practice’, including the company’s IT function – each interview lasted up to 2 hours. Additional data-collection methods included documentary evidence and informal participant observation and discussion. Elements of Selznick’s (1949) theory of commitment were employed as ‘seed categories’ to prime the hermeneutic ‘pre-understanding’ of the phenomenon in order to identify and understand the ‘whole–part’ relationships (that characterize the hermeneutical ‘circle-of-understanding’) which emerged from the interview transcripts and documentary sources. Finally, the case report approach was used to write up the findings.

A META-ANALYSIS OF INTERNET AND INTRANET DEVELOPMENT NARRATIVES AT ANALOG DEVICES

This case description takes the form of a meta-narrative that analyses the social, institutional and organizational dynamics of web-based IS development. The meta-narrative is structured according to the dimensions in Table 1.

Information systems development dramas at Analog Devices: the scene

Analog Devices designs, manufactures and markets a broad range of high-performance linear, mixed-signal and digital integrated circuits for a range of signal-processing applications in electronics and communications. Founded in 1965, Analog Devices employs over 7200 people worldwide. The company is headquartered near Boston and has facilities across the USA, Europe and Asia. Over 1000 of Analog’s largest customers buy directly, placing orders with its sales force worldwide. Other customers source products through distributors or over the internet. Just fewer than 50% of Analog’s revenues come from customers in North America, with the balance from Western Europe and the Far East. While Analog possesses core competencies in product design, development and manufacturing, it also possesses significant compe-

tencies in sales and marketing. This paper focuses on the sales and marketing functions, as they provided much of the impetus for web-based development initiatives.

Electronic and electrical engineers constitute the predominant ‘communities-of-practice’ in Analog Devices; engineers dominate in terms of status, tenure, political influence and ubiquity across almost all organizational functions. This gives rise to an observable degree of ‘institutional tension’ among various constituencies within the organization. This ‘tension’ was particularly evident between the IS function and the relatively independent ‘communities-of-practice’ that constituted the sales and marketing functions. The evolution of the corporate intranet and the development and implementation of internet application in the late 1990s provided an occasion for heightening the ‘institutional tension’ between them.

**Actors and ‘communities-of-practice’**

A period of organizational change in the early to mid-1990s transformed Analog Devices into five product divisions and six corporate divisions. Product divisions are responsible for the design, development and primary marketing of their product lines. The corporate divisions include human resources, manufacturing, research and development, finance, sales and marketing functions.

**The engineer as leading actor**

Most of Analog’s key employees were engineers; they shared a common educational and professional background. This had a significant impact on the formation of Analog’s social matrix and identity, as the Standard Linear Products Division’s (SLPD) marketing manager illustrated:

> Analog has always been an engineering-run and an engineering-driven company, seldom in a time of contraction has the research and development budget been cut; the IT budget is cut, the marketing budget is cut, the human-resources budget is touched, [and] the advertising budget is touched . . . all these guys come from the same universities, from the same professors and they all have been taught the same things.

The common background in electrical and electronic engineering provided social actors with a shared language that facilitated communication and learning across functions. For example, while engineering ‘communities-of-practice’ existed in the product divisions where product research, design and development took place, engineers also constituted the marketing sub-units in these divisions. In addition, engineers also populated all levels in the corporate sales and marketing divisions.

While engineers in the ‘core engineering communities’ used the corporate LAN and WAN infrastructure, they were relatively independent in terms of the computer platforms and applications they used. The IS manager for Sales and Marketing described it as follows:

> We spent the last five years bringing everyone to the new Microsoft technologies and instilling standards on the desktops around the world. Now, the one exception to that is the engi-
The engineering community: the engineering community has traditionally used the Sun platform around Unix, their main tools are CAD and CAM applications. There has always been a division between engineering and their IT support, which happens in the various sites, rather than corporate IT [and its] business applications.

This 'federated decentralised' approach, as one IS manager termed it, to building Analog's IT infrastructure resulted from the way the company operated since its foundation, with product divisions and product lines at various sites, maintained their own IT budgets and tended to provide for their own IT needs.

The important distinction here is that the ownership and control of noncorporate IS rested exclusively with the end-user community, with IS function staff acting in support roles only. This engendered a local sense of community that helped reinforce each 'community-of-practice' and regulated the IS function to a peripheral role in the provision of IT resources. However, the independence that such 'communities-of-practice' had extended beyond the product divisions, as evidenced in the Sales Division's Central Applications function, was staffed by applications engineers who developed and operated a key element of the corporate intranet, with the blessing, but not with the support of the corporate IS function. This system and the political issues surrounding its development are described later.

Information systems and engineering 'communities-of-practice' Until the early 1990s, Analog's IS was centralized and based around an IBM mainframe. Accordingly, the role of IS was to gather corporate financial data. Since then, the IS function has (1) transformed Analog's IT infrastructure into a client/server-based architecture; (2) implemented the Systeme Anwen dung Produkte (SAP) financial package across Analog's sites worldwide; (3) implemented a corporate transaction processing system; (4) developed a corporate data warehouse; and (5) standardized the desktops around Microsoft Windows and Office applications. The one exception to this standardization was the engineering community in the product lines, who used Sun UNIX workstations. At the end of 1998, there were 4000 Windows-based desktop PCs and approximately 2000 Sun workstations in Analog's IT infrastructure. One standard application existed across both platforms – Netscape Navigator. Nevertheless, it was considered that Analog had a state-of-the-art IT infrastructure, although the same could not be said of formal IS support for areas like sales and marketing.

In 1998, Analog's IS function was a departmental subunit of the Finance Division. Analog's senior IS executive, the CIO, reported to the CFO and VP of the finance function. An unusual aspect of Analog's organizational structure is the separation of Sales and Marketing into two independent divisions; however, the IS support function for both was titled IS Sales and Marketing. This was problematic in terms of IS support. The idiosyncratic character of Analog's organizational structure did not end there: each of Analog's five operational divisions had their own marketing subfunction, which operated independently of corporate marketing. While all this led to a situation that was described as 'organized chaos' by one marketing manager, there was a high degree of cross-functional collaboration between the different 'communities-of-
practice’. Such collaborations provided the organization with a network of knowledge links – internally among the various ‘communities-of-practice’, and externally to the design engineers employed by Analog’s customers. It is significant that IT increasingly played a pivotal role in enabling links between intra- and interorganizational ‘knowledge nodes’.

Several ‘communities-of-practice’ were involved in the development of the corporate intranet and the internet site (http://www.analog.com), namely: (1) design engineers in the marketing subfunctions of the various product divisions; (2) marketing managers/engineers and communication professionals from the Marketing Division; (3) Central Applications support engineers, and sales and field engineers from the Sales Division; and (4) IS professionals from the IS function and consultancy firms. Customer design engineers from Analog’s customer base constituted the ultimate end-user/stakeholder group.

The roles played by actors in business ‘communities-of-practice’ in IS development dramas at Analog Devices are best put in context by a consideration of its key knowledge asset – the product data sheet. The product data sheet in its various forms was the primary ingredient in internet and intranet applications. The creation and dissemination of the product data sheet involved the participation of several related ‘communities-of-practice’; accordingly, a high degree of cross-functional communication and knowledge sharing was required. The introduction of the internet- and intranet-based IS instituted new communication mechanisms and paths that changed the way product data were created and disseminated.

Development of Analog Devices’ intranet-based information systems: purpose, actions, agency and trouble

This section describes the purpose, actions, agency and trouble dimensions to the development of intranet-based IS for sales and marketing at Analog Devices.

Purpose and the development of Analog’s corporate intranet

Nowhere was Analog’s cultural diversity, functional autonomy and personal and group creativity more observable than in its approach to the development of the corporate intranet. By 1996, several web-based end-user systems and a plethora of individual websites had appeared on the corporate WAN. Business and IS managers wished to tap into the potential for intraorganizational communication and learning that the new intranet technology offered. In order to develop a strategy that would bring order to the chaos that then existed, the IS function examined how companies such asDEC, Hewlett Packard, Sun Microsystems and Silicon Graphics developed and implemented their intranet strategies. The IS team observed two dominant approaches to implementing intranet technologies. First, they noted that Sun Microsystems and Silicon Graphics had adopted a laissez faire strategy and let staff do their own thing with every workstation having the potential to become an intranet website. DEC and Hewlett Packard took a much more disciplined and rigorous approach by instituting a formal strategy that included the adoption of exacting standards, in conjunction with a corporate template that man-
dated a certain look and feel for each site. The IS function at Analog adopted a strategy that lay somewhere between the two.

To implement the new corporate intranet strategy, an umbrella intranet site was first established and the representatives of all the other sites were informed of new policy. This involved the observance of basic guidelines for end-user developers to publish content on the WAN. The guidelines simply set certain standards for the websites. For example, dead links were not allowed, and a link to the corporate homepage was mandatory, as was the inclusion of the corporate logo on all web pages. No effort was made to tell users as to what content they could place on their sites, but, certain policies had to be observed in respect of nonofficial content. To deal with such issues as duplication of effort and to introduce more functionality and cross-site accessibility, a cross-functional intranet development steering group was established. This was charged with two tasks – to develop standards and to develop generic tools such as a search engine. The group also had responsibility for the formulation of a strategy to guide the direction of the intranet and to determine what additional standards were needed. However, in keeping with the organizational culture, rigid structures were not put in place nor were web authors questioned as to what they were doing with their sites. Even so, some control was maintained over the use of resources to prevent particular groups from monopolizing them.

Intranet support for knowledge management at Central Applications

The Central Applications function was the corporate nexus for all product knowledge, because it was through this function that sales and field engineers, in addition to product distributors, were trained and supported. One of Central Applications’ key roles was to provide product support and technical information over the corporate intranet with its own Lotus Notes-based product and technical support application. Because of the need to better manage customer-related call tracking, customer contact and product application problem-solving, this evolved from a client/server platform into a web-based solution. Since its inception as a client/server system, this application, which consisted of several separate but related databases, has been extended and ported to the corporate intranet via Lotus Notes’ Domino Server. Because of the company’s corporate-wide standard regarding the exclusive use of Microsoft and UNIX applications, the IS function did not support Lotus Notes. Also, Analog’s CIO did not want Lotus Notes client software on corporate desktops; hence, it seemed unlikely that the applications developed using Lotus Notes could be of general use to people that needed the data – that is, sales and field engineers. However, with the advent of the corporate intranet, and with the capability of Lotus Notes’ Domino web server, the Central Applications product support system came into its own. Such was its success that the product divisions and the product lines looked to Central Applications to host new product information on its Notes-based server. The IT consultant at Central Applications described the situation as follows:

When internet technology and Web servers first became available and popular, a lot of people went out and set up their own intranet servers, and it was fun and games for a while. But they soon realized how much work it was to maintain their own sites and keep their infor-
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...information fresh, so what [the Central Applications Manager] did was he went to these people and said ‘Well you know you have this server, and you are keeping information up there, and we know you haven’t been keeping it fresh, basically because you realize what a pain it is to maintain a web server.’ So what he had me do was build a situation where he had me create space, essentially an intranet site under the umbrella of sales and marketing, and we handle all of the design, the maintenance and everything . . . all they have to do is maintain the data, not the whole site. and that’s a tremendous incentive for them, because they do not have to maintain a box . . . So what we have done is make it easy for people, and the [Central Applications manager] feels that if we keep it easy for people they will come.

In addition to hosting new product data for the product divisions, Central Applications also hosted intranet websites for the product lines, as many of them had neither the time nor the inclination to maintain their own.

Action and agency in developing web-based information systems for sales and marketing

While the foregoing describes the ‘what’ of the Lotus Notes-based application at Central Applications, the problems and issues that surfaced during its development are now outlined to gain insights into the business and IT competencies required to develop the application. While Central Applications’ IT consultant possessed the requisite competencies in Notes development to successfully construct intranet applications, he did not initially possess the required knowledge of Central Applications’ business activities – this he built up overtime. The process of requirements elicitation at Analog was incremental, as the IT consultant engaged in a dialogue with the Central Applications manager until he fully understood the requirements. He would then see if it was feasible to implement this using Lotus Notes and if Notes could provide the required functionality. Further discussion would then take place around additional features until the specification was built up. There was, however, a significant informal dimension to the elicitation of system requirements as the consultant shared the same office space as application engineers and regularly communicated with them.

The successful implementation of this groupware application depended upon the commitment of social actors to share data across the system. Application engineers at Central Applications were clearly committed. Bringing the product-marketing engineers on board demanded a significant degree of political persuasion on behalf of the system owner – the manager of Central Applications – especially because these individuals were spread all over the world at Analog’s product design centres. Nevertheless, the Central Applications manager was described by the IT consultant as ‘a very slick politician when it [came] to that kind of stuff.’

High levels of cross-functional participation and commitment were critical for one particular intranet-based application – the New Products Status Update System. Because new product data were input from Analog’s research and development facilities worldwide, the system had to make access simple and the interface easy to use. Hence, the Central Applications manager visited the product line and marketing managers to gauge their interest and commitment. He
quickly recognized that to make the application acceptable, he would have to ensure that the application had a straightforward, standard data-input interface that did not involve file transfers. Hence, the IT consultant suggested a web-based interface to the corporate intranet where marketing engineers could type in the new product data under several headings. Nevertheless, some product lines did not use the web interface and continued to forward new product data to Central Applications in the traditional format, so that application engineers could input it to the Notes database.

It was critical to the successful operation of Central Applications to have up-to-the-minute access to accurate and current new product data to service the needs of sales and field engineers. It was vital that the product lines engineers committed to keep their product-related data current on the Central Applications system. Commitment was fostered by the relationships that the Central Applications manager had built up through consultation and communication. That new product data were published quarterly by Analog through Central Applications, and circulated to the sales and field engineers meant that those who were recalcitrant or neglectful soon became visible. Insights into this process and the ramifications for the product line marketing engineers came from the IT consultant on the project.

What promotes people to do this is that they look bad if they don’t do it. What happens is that once every quarter, when [Central Applications] publishes [new product data] as a hard copy document, [I have] written a program that takes all this information [from the Notes database], formats it, and dumps it into a Word document, and this is circulated to the marketing engineers for the people responsible to inspect it. If they don’t input information here, the information is out of date, and if the information is out of date on the hard copy and their bosses see it, then the hammer comes down on these people.

Thus, a combination of influences – affective and coercive – were at play to instil and maintain commitment in a geographically dispersed community.

Trouble and information systems development

The idiosyncratic configuration of business structures and processes led to an on-going ‘power struggle’ between the IS function and several engineering ‘communities-of-practice’. Take, for example, this comment by the IS manager for Sales and Marketing:

[The manager of Central Applications] has been very successful at developing systems to support what he needs to do. He and I joke about it all the time because we made a decision a couple of years ago not to use Lotus Notes, it just did not fit into our architecture, we went the Microsoft way, he’s been very successful deploying small Lotus Notes applications for his group. I’m not going to come in with a hammer and say ‘You have got to get rid of that because it’s against standards’, it fits a niche. Fortunately, with the advent of the internet, Lotus Notes and its Domino server is just another internet server, as opposed to the whole infrastructure change, where we would have to deploy servers everywhere – it just plugs into
the intranet. So we do have situations now where groups will go and implement their own technology for their own niche requirements as opposed to something for everybody.

Hence, business managers developed IS out of their own budgets, and without IS input, through in-house development, or by importing the required competencies to aid IS development. This independence and autonomy, which paradoxically enhanced creativity in product development, caused problems elsewhere for the IS function and resulted in friction between IS and the business community.

While there was ample evidence of amicable interpersonal relationships between the respective ‘communities-of-practice’, that is, between those populated by engineers and IT professionals, professional relationships appeared to be less amicable. Take, for example, a comment made by the manager of the Central Applications function in the Sales Division:

In terms of IS . . . they introduced a SAP system for accounting and order processing, they maintain the system, but did not develop it; they are essentially system integrators and IT architects. One of the major issues with them is that our technical support needs are not being met. They have elaborate solutions for simple needs, and they impose restrictions on applications support. But because I have my own budget, I have instituted by own solution based around Lotus Notes: this is not a Corporate standard, so I am a mini-IS owner. An uneasy truce exists between myself, my department, and the IS people in Norwood; essentially, what I have found is that their grand solutions are impractical.

The following statement from the IS manager for Sales and Marketing is revealing, in that it may indicate where the fundamental source of the Sales and Marketing Division’s frustration with the IS function:

I think there would be good agreement that there are areas especially in sales and marketing that [the CIO] just does not understand – the soft stuff, customer relationship management [etc.] . . . There is agreement that he is probably too removed from that side of the business, that he might say: ‘Well, wait a second, why are we spending money on that?’

In the absence of a formal strategy and, with what was for all intents and purposes, an ad hoc approach to systems selection, it was inevitable that problems would ensue.

If end-user developed applications complied with the corporate standards, and were of use to other units, the IS function rolled them out, and subsequently supported them. Hence, the Central Applications Lotus Notes/Domino application, which could be accessed through an internet browser over the intranet, gained acceptance in IS, as it did not interfere with corporate standards because of its use of a client browser to access it on the engineers’ desktops. Even so, IS managers refused to provide technical support for the system. Nevertheless, IS was always the first port of call whenever new systems were planned, in order to determine whether or not the IS function could deliver the desired solution. However, because of human resource limitations coupled with a dearth of IT competencies in certain areas, the demand for systems and attendant need to prioritize the systems to be developed meant that the IS function was not
always in a position to deliver a particular solution – here lay another possible source of dissatisfaction with this ‘community-of-practice’.

A top-down, participative approach to developing a corporate identity on the web

Whereas the development of Analog Devices’ intranet-based IS was bottom-up, the corporate internet-based IS involved a ‘top-down’ approach. Nevertheless, the development and implementation was an undoubted success, as the needs of its primary users – that is, customer design engineers – were met. The problems surrounding the development of the IS were political and centred on internal conflicts.

Keeping the customer satisfied: strategy, purpose and web-based development

In 1996, senior management in the Marketing Division decided that Analog should have a presence on the internet. The IS function did not possess the required competencies in web development, so it employed a contractor who specialized in developing applications for the web. Analog’s first corporate website was merely a content site where customers could get basic information on its activities and products. The potential of the internet to develop closer relationships with key customers was not lost on the VP of Strategic Marketing, who saw the need for Analog to develop an internet strategy. Accordingly, consultants were engaged to conduct a survey to help managers better understand the business, where the company was going, what problems it was trying to solve, etc. The findings formed the basis for Analog’s internet strategy.

In the initial phases, the IS function outsourced 80–90% of the work to a specialist in web development. The IS manager for Sales and Marketing, who had overall development responsibility, also brought IS staff onto that project in order ‘to build some in-house expertise in the area, [because of a] concern that in developing so much custom code . . . when [the external web developers from the software company] leave, [internal IS staff] will not be able to support it.’ Of special concern therefore was the paucity of web-based competencies. IS managers admitted that they could not compete with specialized companies.

Subsequently, consultants made a number of recommendations; the most important was recounted by the IS project manager, namely, ‘they said that what we have to do is focus on the design engineer out there, the people that designed products, and that’s how we would get design buy-in, and to facilitate them in designing their products.’ This was a critical issue for the website’s design in terms of its content, look and feel; as a result, the homepage was redesigned to provide customers with immediate access to product data. Content relating to Analog’s corporate profile, annual reports and so on, although readily available, were considered of secondary importance. Nevertheless, significant problems centred on the manner in which product data were presented to customer design engineers.

The IS function, which supported the internet initiative, did not see itself as leading the project, rather that responsibility rested firmly with the corporate marketing function. The corporate website became a source of latent conflict for the actors involved in its development and
support – this was not considered to be a business problem. The following subsections deal first with the development and enhancement of the website, and second with the political issues that arose and that were a source of tension between the functions involved in supporting sales and marketing activities at Analog.

Central actors, critical action and vital agency in the development of Analog’s corporate web presence

The appointment of a Webmaster in mid-1997 was pivotal in the success of the web project. The Webmaster acted as a user project manager whose role was to provide leadership and guidance for the new system’s development, operation and use. Before taking up her role, she had collaborated with corporate marketing to develop a ‘knowledge base’ that would underpin a self-service application and call centre based around a web front-end. In 1996, neither a corporate internet nor an e-business strategy existed. In addition, there was no corporate financial or IS support for such initiatives. When the initial e-business strategy was developed in 1997, it fell to the newly appointed Webmaster to implement it. Drawing on the IT-based competencies acquired in her previous role (in the Computer Products Division and her leadership capabilities as commander of a Coastguard cutter) she set about building a project team using internal resources where possible. However, she had to rely heavily on external consultants because of a paucity of web-based competencies.

The internet development team consisted of external IT consultants with internet-related competencies, IT professionals from IS and the marketing function’s web specialists. The Webmaster co-ordinated the team’s activities and liaised with the Sales Division and the product line marketing functions. Corporate marketing realized that the web offered a more direct and speedy channel to the customer and to the desktop of their most influential customer, the design engineer.

The salient issue for the project team was how to get real-time data published on the web. The approach was to make the product lines, who were the primary authors and owners of the data, manage the data input and web content. Hence, a standard template was introduced for all new product data sheets and cross-functional agreement was reached on the implementation of the new policy between corporate marketing and communications, sales (especially Central Applications) and the marketing functions of individual product lines. Subsequently, the IS function performed a business-planning process for the web in conjunction with the product line people, the distribution function, marketing and communications, and the Webmaster, in order to find ways of capturing customer input on Analog’s past, present and future product direction on the website. A direct outcome was that the product lines began to use the web to offer samples of new products to design engineers, and customers began to order samples over the web. However, the database that operated this service was not integrated with the internet-based SQL-Server database; rather it was present on the intranet. Product line marketing engineers used the external mailing service to forward samples and hard copies of data sheets to design engineers. Hence, the registration process enabled customer details to be captured so electronic newsletters and other support materials could be distributed to them.
Subsequently, Analog developed a comprehensive e-business strategy that saw it take its first step into e-commerce. The Webmaster’s primary design objective was to capture Analog’s corporate identity in order to give visitors to the site a virtual experience. As with typical storefront and manufacturing e-business models, it gave customers the capability to place orders directly over the internet and have transactions port into the back-end Enterprise Resource Planning (ERP) system. Other enhancements included the capability to cross-reference competitor products online. The IS project manager felt that ‘maybe we should be sponsoring something like online chat sessions to allow a dialogue take place between design engineers and product people.’ The corporate journal, Analog Dialogue, which provided a forum for Analog’s own design engineers to present and discuss product-related achievements, was also published online, giving customers and competitors insights into technology trends.

Problems of informal political conflict around internet-based development and business process change

IT provided managers with exciting new possibilities for customer contact, marketing new and existing products, and building relationships. However, others were less enthused as they perceived that tried and tested methods of communicating were to be discarded and replaced by indirect, impersonal technological mechanisms. Predictably, this led to friction, particularly between the sales and marketing functions. This unhappiness did not centre on the introduction of new technology per se, as the contending factions had in the past actively introduced IT to enable their own business processes; rather, it was the decreased emphasis on face-to-face customer contact, and the perceived shift in importance of existing functions and processes. There was also a clash of personalities and management styles. One viewpoint came from the ‘old Analog’, and the other, more brash and evangelical, was associated with the ‘new Analog’. The Webmaster belonged to those who were actively creating the ‘new Analog’, and had been with the company just 7 years. The director of marketing at the SLPD, who was a long-term employee, and who had helped create the ‘old Analog’, voiced similar views. Speaking in an evangelical tone, he declared himself a ‘contrarian’ in his perspective on how the customer interface should be managed. Accordingly, he differed from the vast majority of his contemporaries in the ‘old Analog’, as he strongly advocated a move away from one-on-one and face-to-face contact by sales persons to impersonal contact via the web, and the technical telemarketing call centre.

One of the major difficulties in the implementation of this web-based IS centred on how product details were prepared for publication. In a move that paralleled the intranet policy at Central Applications, the Webmaster shifted the emphasis from authorship and ownership of all new product data to the product lines. The process of producing new data sheets was also accelerated. As before, this involved a collaborative effort between the marketing and communications group, Central Applications, and the product line marketing engineers. Once a data sheet was produced, a PDF file was generated and forwarded to the web group. This resulted in a PDF file being published on the internet in under 48 hours, rather than the 6–8 weeks it had taken previously. The early successes in deploying what was a new technology led some
senior managers to believe: (1) that traditional mechanisms of customer contact were now obsolete; (2) that existing business processes were under threat; and (3) that catalogues, CD-ROMs and sales engineers were now of little value.

The perspectives of IS function managers on IT support for promoting product data to customers are summed up by the IS manager for the internet project:

The [Central Applications Manager] does this on the intranet internally, [the Webmaster’s] is on the internet site: I think maybe that there is some competition there, I don’t think that it is organizationally clear who is responsible for this – it just hasn’t been defined. I don’t think Analog works like that, [Central Applications] have done this for a long time and now [the Webmaster] needs to do this externally. The choices are ‘I can use his stuff or I can do my own thing’; [The Central Applications Manager], I think, gets and maintains it himself, while [the Webmaster] has the product line people do it for her. [Central Applications are] facing field service engineers while [the Webmaster] is facing the customer.

Thus, the absence of an overarching policy on the management of the customer interface at Analog led to competition and unnecessary tension between two important organizational functions. This found expression in a certain duplication of effort. Central Applications had product line engineers input new product data into their Lotus Notes-based intranet website. The Webmaster commented:

[The product lines] have to do this twice now because I’ve seen the same type of approach [in Central Applications] with people putting information up on the Lotus Notes based intranet. Lotus Notes is first of all not a supported platform within the company. Lotus Notes was not something that we could use for the external website.

Of note here is that the IS policy of not supporting the Lotus Notes platform led to a duplication of effort between these critical corporate functions and also led to friction with the product line people, as can be deduced from a marketing engineer who supplied new product information to the web development team:

I do a lot of stuff on the web, I filter out of a lot of the technical stuff, help them on a technical basis because the people doing this do not know an ohm from a bull, and if you drew an operational amplifier like this, for example, that is exactly the way it would be drawn. When you supply this stuff to them you got to really scrutinize what you are sending them.

Clearly, this level of overhead did not arise with Central Applications as the engineers there processed the raw material from the product lines for the data sheets published on the intranet website and also for the short form catalogue and CD-ROM. The reason why product line engineers worked better with the Central Applications people at an operational level, as opposed to interaction on cross-functional managerial teams, is that their common background as engineers helped them communicate better, and this generated higher levels of trust than that with the nonengineering web-development team.

Problems arose between the Webmaster and Central Applications when the latter suggested that a case-based reasoning (CBR) parametric search engine be used for SLPD products,
such as operational amplifiers, which were the most numerous of all the product lines appearing on the internet site. Because it was a nonstandard search tool, the CBR parametric search application was rejected, although it was employed on the Central Applications intranet site. Instead, a standard solution was obtained from another vendor, even though the web-team considered it technically suboptimal.

Another major impact of Analog’s e-business strategy was that it drove a wedge between distributors and their customers. With the advent of web-based direct sales and marketing channels, customers who would previously order indirectly through distributors could order directly from Analog. However, shipping small quantities was not financially optimal for Analog because of its policy of direct shipping from the manufacturing sites – it still needed the distribution channels serviced by its established distributors. Thus, Analog’s entry into e-commerce changed the financial relationship with distributors, as Analog has increasingly taken on some of the marketing and sales roles previously filled by distributors. It was now in a position to demand that distributors reduce their sales margins. Some at Analog argued that entry into e-business brought the customer closer. Nevertheless, others believed this a dangerous illusion.

**DISCUSSION AND CONCLUSIONS: THE MORE THINGS CHANGE**

The empirical findings map well onto previous studies on the development of ‘traditional’ IS, particularly where high levels of institutionalized participation and involvement are in evidence. The case report illustrates that many of the organizational issues that required attention in the development and implementation of ‘traditional’ systems were present in the development of internet- and intranet-based systems at Analog Devices. Problems with organizational conflict, end-user resistance and change management plague the development of ‘traditional’ IS. It is not surprising then to find that such issues arose in the development and implementation of web-based systems at Analog. For example, a high degree of ‘institutional tension’ was in evidence between the various constituencies involved in the development of the systems described, mainly because of established commitments to their ‘communities-of-practice’ (i.e. the ‘centres of interest generated in the course of action’) and to maintaining existing power relationships that were shaped by and that, in turn, reinforced the commitments observed. The existence of high levels of commitment to the local agendas and to maintaining extant power relationships also influenced the manner in which ‘traditional’ development endeavours were conducted and, as such, characterized ‘normal’ relationships between the parties concerned. The existence of such ‘institutional tension’ was beneficial in many respects to the development process and its outcomes, given the socially constructed nature of Analog’s organizational character as evidenced by its idiosyncratic institutional structure, processes and context. Support for this view comes from Euchner et al. (1993), who report that conflict between developers and users was beneficial in the development and implementation of ‘traditional’ systems, although the underlying reasons are by no means clear.

The Analog case illustrates that fostering high levels of commitment was the key to the successful development of internet- and intranet-based IS. It is evident that social actors closely
identified with the socially constructed corporate identity and that this manifested itself in strong commitment to organizational imperatives at all levels. Commitment acted to influence the manner in which knowledge-informing data were created, captured and transferred across the company, and how experiential and technical knowledge translated into the firm-specific business and IT competencies that underpinned the successful development of intranet and internet applications. This was evident in the formal and informal approach to user participation, project management and development strategies employed at Analog. Selznick’s (1949; 1957) institutional theory provides valuable insights into why the observed commitments to different ‘communities-of-practice’ and existing power relationships at Analog were not, on-balance, dysfunctional, and did not produce suboptimal outcomes in relation to the development and implementation of the intranet- and internet-based applications. Potentially problematic sectional commitments of organizational actors – both business and IS – were balanced by: (1) strong commitments to organizational imperatives; (2) commitments fostered by the social character of the organizational actors involved; and (3) commitments shaped by the process of institutionalization. Table 2 provides an overview of the group, social and organizational commitments observed at Analog, which were maintained in a delicate state equilibrium.

User participation was a significant factor in the successful development and implementation of the IS developed at Analog. One consequence of the user-centric approach to IS development was that sufficient time was spent on requirements analysis by both developers and users – hence, the systems as designed met user information needs in highly effective ways. Some have argued that the development of intranet and internet applications radically extends the user base in internal organizational and external contexts, and therefore gives rise to new problems. What tends to be forgotten, however, is that in the past many ‘traditional’ IS has been successfully developed with little or no user input, while the vast majority have been built on the basis of requirements elicited from small numbers of users in comparison to the total population. One observation, however, is that the high levels of informal communication which characterized development initiatives at Analog effectively mitigated many of the user-related problems associated with the development of organizational IS documented in the literature – this was especially evident in the development of intranet applications at Analog.

It may be that the social dynamics surrounding the process by which intranet applications are developed has the potential to minimize or eliminate some of the problems associated with the development of ‘traditional’ IS. For example, one factor contributing to the success of Analog’s participative approach to IS development was the heightened awareness of developers (external consultants or IS staff) to business issues/perspectives, as they worked closely with business users through regular formal and informal contacts. The organizational policy on the use of Total Quality Management (TQM), coupled with the engineering orientation of the ‘communities-of-practice’, meant that project management principles were rigorously applied. In addition, both the internet and intranet applications had top management support and committed advocates in the project teams. While problems of change management and conflict resolution were in evidence, these were addressed more or less to the satisfaction of all concerned, as were the communication-related problems that arose between the different participants. Nevertheless, all of these have been observed in the development of traditional IS development.
Technical problems did not emerge as being significant obstacles to success. Interestingly, issues of human component interface design and web content aside, the technical platforms (e.g. relational database systems and TCP/IP networks) which underpinned the new web-based IS and network infrastructure had previously been employed as components in ‘traditional’ IS.

One reason why business managers and end-users at Analog were able to develop and implement systems of strategic importance successfully was that, in addition to their unique business competencies, they possessed many of the IT-related competencies required for systems development because of their engineering background. Thus, shared experiences as practitioners in the engineering discipline helped staff in business areas develop IT competencies to support their individual or group activities, and to effect transfers of knowledge-informing data between internal and external ‘communities-of-practice’ to the customer.
Another reason why user-centric development was the norm rather than the exception was down to the degree of autonomy and budgetary freedom accorded to business functions. This was a product of the organization’s highly distinctive character, which fostered a culture of creativity and a sense of close-knit community – all of which provided a fertile environment for experimentation and innovativeness. It is significant, however, that the successful development of ‘traditional IS’ at Analog exhibited similar characteristics.

This study highlights the two ‘classical’ approaches to IS development – ‘top-down’ and ‘bottom-up’ development strategies. ‘Top-down’ development strategies tend to be driven by management imperatives, implemented either by dictat or negotiation, and led and controlled by senior managers or their representatives. ‘Bottom-up’ strategies are user led, but nonetheless driven by organizational imperatives. They involve a greater degree of consensual development than typical ‘top-down’ strategies. The development of the Analog’s internet application was effected using a ‘top-down’ approach, while the development of the intranet platform was certainly ‘bottom-up’. Nevertheless, as with the development of ‘traditional IS’, the development and implementation of web-based IS involved high levels of user/stakeholder participation and this contributed to their success.

IS success is **ceteris paribus** associated with high levels of user participation. The case report indicates that the user acceptance and satisfaction with the intranet-based system was higher than that of the internet-based application. This is interesting for several reasons. Take, for example, that the ultimate end-users of the internet platform were design engineers working for Analog’s customers. Why were internal stakeholders of the system apprehensive about its introduction? Simply because there was a perception that the IS might alter established communication channels with the customer and lead to a change in role-related responsibilities and remuneration of Analog’s sales and marketing engineers, among others. It is evident that the ‘top-down’ approach to web-based development and implementation was problematic, as the findings indicate, while the ‘bottom-up’ approach achieved higher levels of user acceptance and satisfaction. Thus, previous findings are confirmed in relation to the development of ‘traditional’ IS, in that user-led development facilitates system ownership and permits more realistic expectations about system capabilities to be developed, while simultaneously decreasing user resistance to change and committing users to the system. Nevertheless, because the overall culture provided an arena for bargaining and conflict resolution about design issues, the ‘top-down’ approach also achieved a great measure of success. In conclusion, this paper illustrates that social and organizational issues surrounding ‘traditional’ systems development in organizations remain more or less unchanged.

**REFERENCES**


Biography
Tom Butler is a College Lecturer in Information Systems at University College Cork, Ireland. Before joining academia, Tom had an extensive career in the telecommunications industry, chiefly in the development and operation of IT infrastructures. His primary research focus is on the development and implementation of IS, while his secondary research interests encompass hermeneutics, knowledge management, and, more recently, the digital divide. Tom received his PhD from the National University of Ireland at UCC, where his doctoral research examined the role of IT competencies in building firm-specific IT resources in knowledge-intensive organizations.