

## What Drives the End User to Build a Feral Information System?

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### Abstract

*A Feral Information Systems (FIS) is any technological artefact (e.g. spreadsheets) that end users employ instead of the mandated Enterprise System (ES). ES proponents suggest that the installation of an ES will boost productivity. However, Production Possibility Frontier theory provides insights as to why the introduction of an ES may instead suppress an end user's productivity. Structuration Theory offers insights that explain how certain end users may have access to powerful resources. Rather than submitting to the ES, the end user can employ FIS to block or circumvent aspects of the ES. Further, the concept of life chances helps explain why individuals may or may not develop the core skills required to construct an alternate to the ES, the FIS. In relation to the ES usage, an end user may adopt one of four Modes of Operation, namely: Submit, Dismiss, Hidden, or Defiant.*

### Keywords

Feral Information Systems, Enterprise Systems, Structuration Theory, End User Modes of Operation, Production Possibility Frontiers

## INTRODUCTION

One of the design goals of Enterprise Systems is to collate the scatterings of corporate information stored on desktop spreadsheets/databases and store it in a centralised location for the good of the organisation (Davenport 1998). There are, however, numerous examples of End User persisting with storing corporate data on desktop computers in defiance of the sanctioned Enterprise System. We call such End User developed artefacts: Feral Information Systems. While acknowledging the work of others to increase the understanding of similarly termed problems of Workarounds and Shadow Systems, the work is incomplete. We believe there are unexplored avenues, such as the valid reasons why end users develop Feral Information Systems and the inflexibility of Enterprise Systems.

This paper pulls together, what may appear at first glance, a number of incongruent theories in a novel manner that we have not seen done before in the literature. This includes Five Role Theory (Askenäs and Westelius 2000), Structuration Theory (Giddens 1979; Giddens 1986), Knowledge Workers (Drucker 1999), Webber's Lebensstil (Abel and Cockerham 1993), combined with classical economic theory. This provides a platform to develop our proposition that there is a fertile ground for Feral Information Systems to develop when:

- A. the End User has access to sufficient *resource* to parry the Enterprise System proponents attempts to use *coercion* to enforce Enterprise System use
- B. the End User's journey though time-space is such that they have the skills to develop a Feral Information System
- C. loss of productivity associated with using an Enterprise System forces the End User along the Production Possibility Frontier to the point that a Feral Information System is employed to recover lost production function

In the second part of this paper, we discuss our in-progress case study at a medium sized Australian based utility. While in the process of testing our propositions, we noted that the relationship between the End User and the Enterprise System would fall into one of four quadrants. Depending on the End User's access to

*transformative capacity* and their skills in developing a Feral Information System, the relationship would fall into one of quadrants that we called; submit, dismiss, hidden, or defiant.

## **THEORETICAL BACKGROUND**

### **Feral Information Systems**

A *Feral Information System* (FIS) is any information technology artefact that an End User employs instead of the mandated Information System, a term coined by Houghton and Kerr (2006). Usually, End Users create Feral Information Systems using corporately supplied, commercially shrunk-wrapped, desktop spreadsheets and databases (e.g. Microsoft Excel and Microsoft Access).

Literature has other terms that overlap the definition of FIS: namely, Workarounds, Shadow Systems, and occasionally Maverick End User Development. Literature uses the term “workarounds” to describe actions that the End User has employed to manipulate the Information System and associated organisational processes. This spans actions that are either hostile to or supportive of the process of the host organisation. The literature often mentions the use of desktop spreadsheets and databases. Most of the literature that discusses workarounds has the perspective of watching an End User attempting to resolve tension between the demands of the Information System and their immediate work needs (Askenäs 2004; Boudreau and Robey 2005; Ferneley and Sobreperez 2006; Gattiker and Goodhue 2005; Grant and Hall 2005; Ignatiadis and Nandhakumar 2009; Orlikowski 1992; Orlikowski 2000; Soh et al. 2000; Van Stijn and Wensley 2005; Wagner and Newell 2006; Whitley 2006).

Other works apply the term “Shadow System” in a similar vein, describing the use of Information Technology artefacts to assist End Users overcome, whether perceived or real, inadequacies in the sanctioned Information System (Grant and Hall 2005; Orlikowski and Yates 2006; Scott and Wagner 2003). Occasionally literature uses term Maverick End User Development (EUD) in the same context (Ferneley 2007). While there are subtle differences in context, for practical purposes, this paper considers the terms FIS, Workarounds, Shadow Systems, and Maverick EUD in the literature as interchangeable. Building a Feral Information System implies some form of rejection, fully or partially, of the sanctioned Enterprise System. In the next section, we will discuss an example from literature where the End Users had sufficient resources to *dismiss* an Enterprise System.

### **Five Role Theory**

The Five Roles of an Information System is a theory developed by Askenäs & Westelius (2000). Askenäs developed the theory from her observations of an Enterprise System implementation at a large company over a period of a decade (Askenäs and Westelius 2000). By adapting elements of Giddens’ Structuration theory, Askenäs examines how well the Information System matches the host organisation to derive an “*IS fit with structure*”. Drawing from Actor network Theory (ANT), Askenäs (2004) assigned actor roles that the information system assumes within the organisation. She called these roles “*Bureaucrat*”, “*Manipulator*”, “*Consultant*”, and “*Administrative Assistant*” (Askenäs 2004).

The fifth role in the theory, the “*Dismissed*” state, does not fit into any of the quadrants. In the *Dismissed* role, the End Users have rejected the Information System by deliberately choosing not to use it. In her case study, Askenäs (2004) noted the salespeople had turned their ability to generate income for the company into strong bargaining power to overcome the Information Systems’ inherent power. The salespeople put forward the argument that using the ES was affecting their productivity, reducing the company’s income. Askenäs (2004) did not explore beyond the dismissed state. Her work is silent on whether there is a predisposition for End Users to reside on one or more of the four roles before entering the *Dismissed* role. Later on, this paper will revisit the *Dismissed* role. In the next section, this paper will draw on some aspects of Structuration Theory.

### **Structuration Theory**

As a general statement, employees follow their employer’s administrative rules. In the cases studies presented by Askenäs, Kerr, and Houghton, the line employees did not follow these administrative rules. In these examples, the sales people refused to use the new ES (Askenäs 2004) and the operational managers supplied the ES with misleading information (Houghton and Kerr 2006). Structuration Theory can provide some insight into why this could occur.

For a theoretical framework that makes almost no mention of Information Technology, Structuration Theory has been widely cited by researchers interested in Information Systems (Karsten and Akademi 2008). This paper will concentrate on selectively appropriating elements of Giddens’ work for application. An approach endorsed by Giddens (Karsten and Akademi 2008). Giddens nominates three dimensions of structure: signification, domination, and legitimation. The related dimensions of interaction are; communication, power, and sanctions. Structure and interaction are linked through the modalities of: interpretive schemes, facilities, and norms.

Of particular interest to this research are the modes of *domination*. Domination involves asymmetries in resources that is then used to sustain power in relationships (Giddens 1979). In Structuration theory, the two main resources that provide domination are allocation and authorisation (Giddens 1979; Giddens 1986). Allocation resources are the capability "... to generate command over objects or material phenomena ..." and authorisation is the capability "... to generate command over persons ..." (Giddens 1979). Of use is Giddens' concept of how resources are the media of domination and access to a transformative mechanism. Transformative capacity in turn can feed back into the original mode of domination. If human agents have access, they may use authorisation and allocation resources in either modes of domination or transformative capacity on the structure of domination (Giddens 1979).

### **Structuration theory to explain potential enablers**

This paper contends that existing theoretical elements available in Structuration Theory (Giddens 1979; Giddens 1986), Lebensstil (Abel and Cockerham 1993), Knowledge Workers (Drucker 1999), and Five Role Theory (Askenäs and Westelius 2000) can be combined with classical economic theories in a way that appears to have received limited attention in previous research on Feral Information Systems.

In Structuration Theory, domination is one of the three dimensions of structure to sustain power in relationships (Giddens 1979). With the two main resources for domination is access to allocation and authorisation resources (Giddens 1979; Giddens 1986). Consider how the concept of domination is applied to a hierarchical organisational structure. The hierarchical structure facilitates vertical command and control of the organisation's resources (Walczak 2005). As such, the top level of this structure (e.g. the Chief Executive Officer or President) is often the reservoir of all allocation and authorisation resources in most organisations. (For the moment, we will ignore any checks and balances that organisations put in place around the CEO.) Typically, the CEO will delegate subsets of allocation and authorisation resources to subordinates with clearly defined boundaries that limit these powers. In turn, there may be further rounds of delegation down the organisational structure. The further one moves away from the organisation's head, the more limited these powers typically become (Giddens 1979).

Consider a Knowledge Worker embedded towards the bottom of this hierarchical structure. While near the bottom of the organisational structure, a Knowledge Worker is not without access to alternate modes of domination. As Giddens states, "*An administered society is one in which centralised control of 'knowledge' or 'information' is a medium of domination*" (Giddens 1979). The Knowledge Worker assists organisations wield control of knowledge or information. Thus, the Knowledge Worker has access to a resource, which they can use to engage in a transformative capacity. The relationship between the host organisation and the Knowledge Worker is often symbiotic (Drucker 1999). Knowledge Workers are therefore in a better position to parry the classical modes of domination that management can hold over them.

Clashes between management and workers, invoking modes of domination with the introduction of Enterprise Systems, has been briefly mention in literature before. For example, the employee issues when FoxMeyer introduced SAP R/3. Fearing their employment tenure, employees started to leave on mass before the system was introduced, with one report of employees taking less than appropriate care with the merchandise (Scott 1999). Structuration Theory can be applied to the FoxMeyer case. The only option the employees had left to disengage from the FoxMeyer's mode of domination was to conduct employment self-destruction with FoxMeyer and start afresh elsewhere. Giddens noted, "... *self-destruction is an always open option, the ultimate refusal that finally and absolutely cancels the oppressive power of others* (Giddens 1979)".

This paper proposes a theoretical extension to the circumstances where a Feral Information System may or may not develop. If the End User has access to alternate modes of domination, they may be emboldened to develop a Feral Information System in spite of the traditional modes of sanctions that Enterprise System proponents could use against them. In other words, End Users were substituting their own artefacts for the firms IT Capital investment. The division between IS Departments and the rest of the organisation is even clearer post arrival of the personal computer, were literature provides numerous examples of End Users constructing Information Technology artefacts on desktop computers that the Information System Department did not even know existed. Some Knowledge Workers are prepared to reallocate their resources over the short term in such a manner that will increase the ability to build/improve artefacts: with the overall goal of increasing rewards and/or minimising their costs in the long term.

There could be various norms and practices (Giddens 1979) at the workplace that alter how and when Knowledge Workers substitute their own artefacts for the firm's artefacts. Not using the firm's artefact may invoke some form of a sanction from the ES proponents. Alternatively, the firm's environment may tolerate or even actively encourage End User Computing (Kanellis and Paul 2005). This access to technology, or lack of access, alters the Production Possibility Frontier for the Knowledge Worker. Balancing the modes of sanction is

our earlier discussion that Knowledge Workers often have access to allocation resources that they can harness in a transformative capacity. A certain Knowledge Worker may be so valuable to the firm that it will tolerate his/her rejection of the Enterprise System.

An aspect of Structuration Theory is the interaction of social institutions across “*time-space*” and the propagation of *homeostatic* loops (Giddens 1979), and how education is used to break such cycles. Education is life throwing a chance at the individual. Only some accept the offer. In the next section, we discuss how life chances fits in with the development of Feral Information Systems.

### Being able to develop alternatives

*Lebenschancen* (life chances) along with *Lebensführung* (life conduct) are the two basic components of Weber’s *Lebensstil* (lifestyles). Unfortunately, there is a dearth of independent translations of Weber’s work into the English language. With some literature expressing concern that the sparsely available English works do suffer key mistranslations from the original German (Abel and Cockerham 1993). To avoid paraphrasing inducing any further derogation of Weber’s work, Abel and Cockerham’s interpretation is reproduced below.

*‘Weber used three distinct terms to express his concept of lifestyles. These terms are “Lebensstil” or “Stilisierung des Lebens” which mean lifestyles, and “Lebensführung” (life conduct) and “Lebenschancen” (life chances), which comprised the two basic components of lifestyles. Lebensführung refers to the choices people have in their selection of lifestyles and Lebenschancen is the probability of realizing these choices. In Anglo-American sociology, the link between choice and lifestyles appears to have been overemphasized, while the connection between lifestyles and life chances has received little attention.’ (1993).*

This paper suggests that *Lebensstil* has an important role to play in the development of Feral Information Systems. *Lebensstil* forms part of the bridge between Askenäs (2004) Five Role Theory and Houghton and Kerr’s (Houghton and Kerr 2006) work on Feral Information Systems. For a Feral Information System to exist, End Users must first be in a position to be able to “*dismiss*” the Enterprise System. Next, End Users must have had a suitable *Lebenschancen* and then chartered a course of *Lebensführung* to arrive at a time-space point where these skills provide the opportunity to construct a Feral Information System. Next, this paper will explore some of the economic drives that could force an End User down the road of constructing a Feral Information System.

### Technology and Productivity Frontiers

It is an accepted economic axiom that there are unlimited wants competing for scarce resources. How countries, firms, or individuals allocate these scarce resources between the unlimited wants involves making trade-offs. Each option forgone has an (lost) opportunity cost. For example, at the macro level, a country might have to choose between allocating labour resources to support a mining industry or a manufacturing industry. Say a country decides to reallocate labour resources to increase mining output to seek more foreign income. At first, the individuals with the lowest opportunity cost (i.e. those who are most adaptable to transfer) move across to mining. As the transfer continues, the process had to draw down on employees who are better at manufacturing than mining. The Marginal Rate of Transformation (MRT) decreases (i.e. there is less improvement in mining output per transferred employee, with a significant reduction in manufacturing capability). If we plot the MRT between mining and manufacturing, the result would be a chart displaying the Production Possibility Frontier (PPF) for this grossly simplified two-sector economy. The PPF curve represents the maximum possible output with the available inputs (Erber 2006). The area under the PPF represents a “*production possibility set*”. If we take a random sample of firms and plot them within the production possibility set, we might note local conditions may afford some firms the luxury of sitting well inside the Production Possibility Frontier. Such firms, operating inside the PPF boundary, have some form of technical or allocation inefficiency. It is theoretically impossible to operate outside the PPF boundary with the current mix of resources and technology.

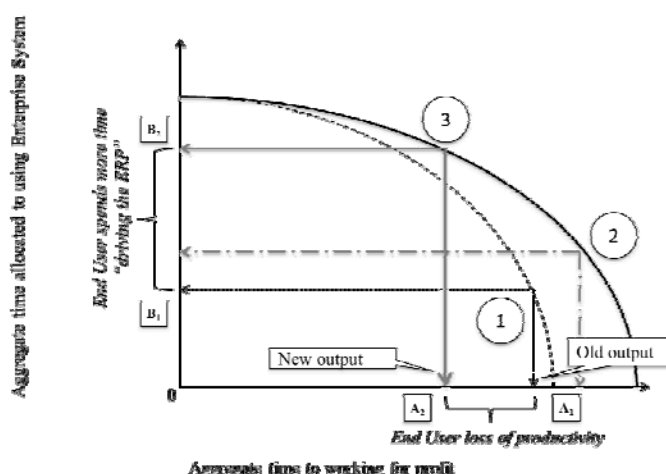
Consider a mining firm that wishes to increase its output, but the economy is at the point of MRT where any additional mining employees are not very efficient. One way to express production costs in the form of a function  $V = f(C, K, L)$ . Where C = IT Capital, K = Non-IT Capital, L = Labour (Dewan and Min 1997). The mining firm has some discretion in how it manages its inputs between IT Capital costs (C), Non-IT Capital (K) costs, and Labour (L). Instead of adding inefficient labour, an alternative for the mining firm is to increase capital spending on technology to improve productivity. This technology might be traditional capital, say, a new excavator. Alternatively, it might be a new IT system to eke out efficiencies in existing processes. Indeed, organisations are routinely investing in IT Capital in a manner that “*displaces other inputs*” (Dewan and Min 1997). Theoretically, an investment in IT Capital should only proceed when it will have a positive impact on the production function of the organisation.

One option available to the mining firm is to invest in a new Enterprise System. Organisations implement Enterprise Systems to improve business decision making, streamline the business processes, improve productivity, and lead to increased profitability (Beatty and Williams 2006; Hayes et al. 2001; Iskanius 2009). For government and non-profit organisations Enterprise Systems are used to increase social good (Greenhalgh and Stones 2010). The decision to install an Enterprise System should primary be one to push out the Production Possibility Frontier. The improvement in PPF does not have to be uniform across all factors of production. An asymmetrical increase in one factor of production also provides the organisation the option to relocate along the PPF to allow increases in output for unrelated items. While some technology is accepted or rejected on cultural or aesthetics grounds, this paper puts forward the prime rational that businesses accept a new technology is to improve their production function. In turn, this will allow the business to expand its PPF to gain an advantage, producing same output with fewer resources or a soft attribute that makes the final output more attractive to customers (Bresnahan 2002).

**ES influences on micro PPF**

Like countries and firms, individuals too have scare resources to supply unlimited wants. The concept of a Production Possibility Frontier applies to the individual in both their private household (e.g. spending time studying for university or mowing lawns to pay the bills) and the workplace. At the workplace, employees face a range of tasks: including time spent using the corporately sanctioned Information Systems. It is possible to construct a PPF curve that shows aggregate time using Information Technology and aggregate time on profit making activities (Schiller and Ernst 2010). Figure 1 is a PPF curve for an individual who interacts with the corporate Information Systems. They have to spend part of their time interacting with one or more corporate IS and the employee spends the aggregate of the remainder doing work that will generate profit for the firm. Pre-ES implementation, the individual is at Point 1 on the PPF curve (Figure 1). To improve productivity, the firm upgrades the existing corporate IS suite by installing a new ES. The system proponents acknowledge that the employee will have to spend more time interacting with the ES, however, the improvement on productivity (i.e. the production function) is such that this will more than compensated for. The ES proponents are envisioning that the ES will move the firm's Production Possibility Frontier outwards so that the employee will end up at Point 2 on Figure 1.

There are examples of ES implementation, however, where the change in production function is asymmetrical across the organisation. This includes; negative impacts on individual's production function (Gattiker and Goodhue 2005; Hutchinson 2008; Meissonier et al. 2007), using the implementation as a mechanism to promote self-interests at the expense of other parties (Meissonier et al. 2007), and hidden agendas in the implementation with the goal to increase personal utility (Hutchinson 2008). What has happened is that demands of the Enterprise System forces the employee to spend additional time using it (aggregate time spent moves from B<sub>1</sub> to B<sub>2</sub>). This forces the employee to move along the Production Possibility Frontier (Point 3 on Figure 1). The result is the employee spending less aggregate time on profit generating activities for the firm (employee moves from A<sub>1</sub> to A<sub>2</sub>).



**Figure 1 - ES induces loss of End User productivity**

This leads to a question. What do employees do if, after an Enterprise System implementation, they find themselves with a suppressed production function and pressure to maintain, or an expectation to improve upon, pre-implementation productivity?

## RESEARCH METHODOLOGY

The research is part of a PhD paper using a case study approach. The selected paradigm for this research is realism; heavily weighted towards post-positivism but not completely closed towards constructivism. Accepting Healy & Perry (2000) view that “*there is a ‘real’ world to discover even through it is only imperfectly apprehensible*”. The organisation under study is a medium sized Australian based utility, with approximately 4 000 employees. The researcher is a full time employee of the organisation under study. This embedment and over 30 years continuous service with the organisation provides access to a wealth of data beyond available to a visiting researcher. The researcher has access to raw data in the form of business plans, investment cases, emails, and senior manager statements.

The researcher will interview using a purposeful sampling. Potential interviews are those who are in a range of roles identified by the literature review. This research is adhering to Yin’s three principles of data collection; using multiple sources of evidence, store evidence in a case database, and maintain a chain of evidence (Yin 2008). The study is broken into two phases. Phase 1 serves as a pilot study. It involves an initial round of five semi-structured interviews, plus a first pass at data collection. Methods of collecting data include observing the Feral Information Systems in action, technical assessment of the core code (e.g. AJAX, Visual Basic for Applications, etc.), business process documents, training materials, and organisational communications. Phase 1 also serves as a learning instrument for the researcher to test ideas and methods for soundness (Maxwell 2005). Following a period of data review, introspection, theory building and theory testing; the research will expand into Phase 2. In Phase 2, the sample size will increase to approximately 30 persons. A number of employees from other organisations have informally expressed an interest in participating. The research is open to conducting further interviews in other organisations if time and resources permits.

Maintaining confidentiality and anonymity is always front of mind during this research. Even before the research began, the researcher was acutely aware that the media had previously subjected the research site to intense scrutiny over an unrelated matter. Any hint of Enterprise System failure, or even partial failure, could easily ignite another unwelcomed round of adverse public criticism and polarising political commentary. Unfortunately, any concerns of adverse media coverage tend to drive problems further underground. For a number of reasons, this makes it harder for researchers to investigate for root causes. First, most potential research sites will refuse to participate. Second, potential interviewees are more inclined to avoid discussing or direct the conversation away from perceived controversial matters. At times, these are matters at the heart of Feral Information System development. Third, on occasion the interviewee will broach matters in the interview and, after subsequent reflection, requests that information be redacted. Ethical considerations compel the researcher to respect redaction requests, even when the discussion is of high value towards the effort of discovery. The study has two phases, a pilot study phase, and then the full study. Presently, the pilot study phase is complete and some preliminary results are available for discussion.

### Data Collected

At the time of writing, we have completed ten interviews. Total interview time to date totals 7:19 hrs (max 1:20 hrs, min 25:46 hrs, average 0:43 hrs). This yielded approximately 68,000 words across the interview set (max 12 563, min 3 572, average 6 804). Three authors provided a copy of their Feral Information System (one spreadsheet and two desktop databases), with one author’s Feral Information System available on an intranet for the researcher to review. This gives four Feral Information Systems for analysis.

Feral Information System 1 (FIS1) is a desktop database that End Users updated weekly using a CSV extract from the Enterprise System. FIS1 monitors the key metrics for a department of 90 people. Even though it is based on the same data set, FIS1 is used in preference to the sanctioned reports from the Enterprise System. Feral Information System 2 (FIS2) uses web based technologies to mash data from various sources, including the Enterprise System, and to store engineering information and decisions in a backend Oracle databases. There are approximately 400 users of FIS2, over 10% of the company’s employee base. FIS3 is a small desktop spreadsheet. The spreadsheet stores a hand-synchronised replica of a small subset of data in the Enterprise System and extends this with supplementary data. Ideally, the supplementary data should be collocated with the primary data sources, but for various reasons it is not. FIS3 use to be the prime data source for reporting certain information to external stakeholders. FIS4 is a large and complex desktop spreadsheet. For a number of years, this spreadsheet with the prime source of information about the host company’s profit & loss statement. We also have a copy of a database that the IS Department once used to collect details about non-Enterprise Systems with a view to shutting these systems down.

Of the ten people interviewed, four people are Feral Information System developers. One interviewee was a co-worker who uses a Feral Information System developed by a colleague who has left the business a few years back. Four of the people interviewed are managers of people who have developed and/or use a Feral

Information System. One person is a manager of Information Systems whose job it was at one time to “close down” Feral Information Systems and migrate users across to the Enterprise System.

## **PILOT STUDY PRELIMINARY RESULTS**

### **Loss of Production Function**

We present two situations from the pilot study and we have labelled these SIT1 and SIT2. We have anonymised interview candidates with labels IC1 and IC2.

SIT1 involves a Feral Information System that is a spreadsheet (FIS1). FIS1 extracts data from the corporate systems to provide enhanced reports for a department. While there are some corporate reports available for this department, the corporate reports often contain misleading errors about the department’s performance that cast the department in poor light with the C-Level executives. IC1, a department manager, describes the corporate reports as; “... it is noise. It creates conversations in the management of the organisation, which cost us a whole of time and energy, but no purpose.” We draw the conclusion that the Enterprise System is suppressing the department’s production function by creating unnecessary work and it is a poor fit to the local needs. The lowest cost option for the department manager is to sponsor a Feral Information System to counter data from the corporate systems. This is achievable as the department has a person with sufficient IT skills to build such a system. This is example of the *Lebensstil* concept in action as another person might be unable to build a Feral Information System. Further, this FIS operates in open defiance, to the point of hostile competition, of the sanctioned corporate reports.

### **Alternate Modes of Domination (an example?)**

SIT2 involves a Feral Information System that runs on web browser technology on the corporate intranet (FIS2). When first employed, IC2 followed (submitted to) the corporate processes. IC2 has a high skill set with information technology. Frustrated with the time spent manually cutting and pasting data between corporate systems, IC2 invested some time understanding the ODBC drivers supplied as part of the locked down corporate desktop Standard Operating Environment. Within a few months, IC2 was able to bypass the desktop GUI, the associated security mechanisms, and extract data directly from the back end of the corporate databases: including the corporate Enterprise Resource Planning system. FIS2 *mashup* data screens provide a sophisticated decision support tool for the process operators. The GUI for FIS2 was an improvement over the sanctioned systems and offered End Users a productivity gain. Initially, FIS2 was hidden from the IS department. Over time, its popularity grew to the stage that over 5% of the total employee base uses the FIS. In describing IC2’s concerns about retaliatory sanction from the IS Department, IS1 states: “ ... I have experienced in the past that those managers above me who would like me to do one of these things, often do have the power to ignore the IT department. So, I, by extension, am able to exercise their power invested in me ...” Once again, there is the theme expressed of the loss of production function associated with using the corporate Enterprise System and poor fit to local needs. This FIS creator has passed through three distinct stages. First, IC2 had no option but to submit to the sanctioned system. Second, while originally possessing formidable IT skills - How many employees outside the IT department know how to operate a packet sniffer? - IC2 had to develop further abilities to construct FIS2. In its early existence, FIS2 remained hidden from the IT department. The third phase occurred as FIS2 grew in stature. It moved from cowering from the IS department to operating in open defiance.

## **THEORY DEVELOPMENT**

### **End User Modes of Operation**

Preliminary data from the pilot study suggests the following antecedent conditions are factors that drive End Users to consider FIS development. First, the sanctioned Enterprise System has poor fit to the business needs at the local level. Second, the Enterprise System is creating an aggregate loss of Production Function. That is, the primary output – the reason why the End User was employed - from the End User is declining. Third, the organisation is maintaining pressure on the End User to either maintain or increase productivity. Once these antecedent conditions are in place, the End User will resort to one of four Modes of Operation. Their choice of Mode of Operation depends on two variables: their perceived access to transformative capacity and their ability to develop an alternative IT system. The first variable, access to transformative capacity draws on Structuration Theory. As discussed earlier, Knowledge workers, in particular, have good access to “the material levers of transformation” as they own the means of production. However, this does not exclude others inside the organisation that has control over various modes of domination (e.g. an influential sales person). The second variable, how good any one individual’s ability is to develop an alternative IT system, is heavily dependent on

their life's journey through space-time (i.e. Weber's concept of *Lebensstil*). The four quadrants for the Modes of Operation thus are; submit, dismiss, hidden, and defiant (see Figure 2)

**Submit**

If an End User has low access to transformative capacity and insufficient IT skills to overcome corporate roadblocks, they will have little option but to *submit* to the Enterprise System. (There is one final option, to commit – in Gidden's vernacular - job "suicide" by resigning and looking for other employment.)

**Dismiss**

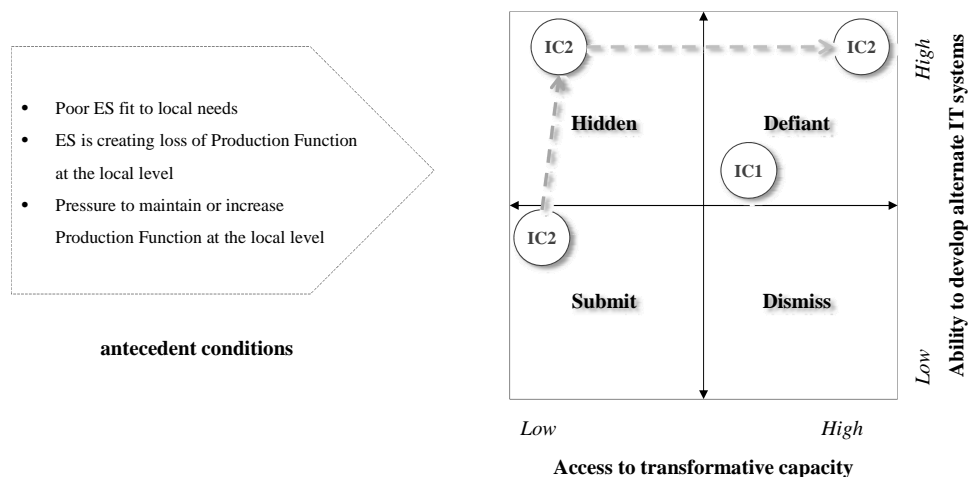
If the End user had high access to transformative capacity but still only has low IT skills, they can openly put the Enterprise System into the *dismissed* window. The *dismissed* window significantly overlaps Askenäs' theoretical work (Askenäs 2004; Askenäs and Westelius 2000). In the dismissed window, the End Users have openly refused to use the Enterprise System and the system's proponents are powerless in the face of this defiance. In rejecting the sanctioned system, the End Users placed the problem back in the proponent's lap to solve.

**Hidden**

If the End User has perceived low access to transformative capacity, but some level of IT skills, they may elect to operate in the *hidden* window. In the *hidden* window, the End User develops a Feral Information System to prop up their production function so they can meet the conflicting demands of poor information system fit and baseline productivity levels.

**Defiant**

If the End User has high access to transformative capacity and a certain level of IT skills, they may elect to operate in the *defiant* window. In this mode, the Feral Information System openly operates inside the business and the ES proponents have few recourse mechanisms to shut it down. When operating in the defiant window, the End User is self-aware that they can block punitive action aimed against their development and use of a Feral Information System. For example, they may be so important that the organisation cannot afford to take sanction against the End User. To do so could see a valuable "means of production" walk out the door. Alternatively, the End User may be operating under the sponsorship of a senior executive. This senior executive is in a position to block any modes of sanction that has to traverse the organisation's hierarchy.



**Figure 2 - End User Modes of Operation**

Marked on Figure 2 is the current placement and past trajectory of the two End Users who created Feral Information Systems examined as part of the pilot study. IC1 created their FIS in open *defiance* of the sanctioned ES. IC2 first had to *submit*, and then quickly moved to developing a *hidden* FIS, before finally accumulating enough alternate mode of domination for the FIS to move to the *defiant* window.

It is possible for End Users to move between various modes. End User access to transformative capacity may move over time. For example, a Sales Person - like the ones in Askenäs' case study – may think they have sufficient domination over resources to *dismiss* the Enterprise System initially. However, over time, the



organisation may take actions, like hiring a new sales team that is willing to use the Enterprise System, which erodes this domination. This leaves the End User with few options other than to migrate to the *submit* mode. Alternatively, an End User who is stuck in the *submit* mode of operation may be embolden to develop Information Technology skills, like learning how to use spreadsheets. Over time, they may develop Feral Information Systems. Nevertheless, since they are still lacking access to transformative capacity, the chosen mode of operation remains *hidden*. Alternatively, an End User, say, a young Knowledge Worker just out of university equipped with excellent programming skills, may develop a rather sophisticated yet *hidden* Feral Information System. As the young Knowledge Worker has developed the Feral Information System to solve local business problems, it might have excellent "fit". Local End Users adopt this FIS. As it has improved productivity, the FIS wins plaudits from local management. With increasing managerial sponsorship, the FIS mode of operation moves from one of *hidden* to one of *defiant*.

## CONCLUSION

Structuration Theory provides a theoretical framework for understanding how some End Users have sufficient *resources* to parry any attempt of *coercion* to use the Enterprise System. Some End Users are in a position to dismiss an Enterprise System and there is little that the ES proponents can do about it. There is a default assumption by ES proponents that the installation of an Enterprise System will lift the End Users production function. However, Production Possibility Frontier theory demonstrates that it is possible for an End User to experience a loss of production function if they have to allocate too much of their aggregate production to recently implemented Enterprise System. If an End User experiences a loss of production function, they have access to alternate modes of domination, and their trajectory through space-time is such that they have accumulated the skills *Lebensstil* (lifestyles), they may elect to develop a Feral Information System. The interaction between this available skill set and the End User's access to transformative capacity provides one of four possible Modes of Operation; *submit*, *dismiss*, *hidden*, or *defiant*.

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