

FERAL SYSTEMS: WHY USERS WRITE THEM AND HOW THEY ADD VALUE

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Abstract

Feral Systems have been defined as an end user development phenomenon wherein end users covertly engage themselves in developing systems to assist them in their operational activities without the blessing or support from the top management and outside the purview of the organizational information systems. Users are motivated to develop feral systems through dissatisfaction with formal systems, perceptual and social factors and by power tensions within organisations. Although outside the purview of IT management, feral systems can bring a number of benefits to users and to organisations, but at the same time they have the potential to add to the risks the organisation faces and to reduce the value of formal systems. Recognising these contradictions IT managers are encouraged to create environments that bring feral systems into the open so that the risks can be reduced and the full benefits of these user driven initiatives derived. There is limited research on this phenomenon and possible future research is identified that would explore the environments that appear to particularly encourage the development of feral systems, and the nature of feral systems most commonly developed. This knowledge will be valuable in the future management of formal systems, particularly ES, which are in general fairly prescriptive in what they allow users to do and not do.

Keywords: Feral Systems, Shadow systems, Work-Around Systems, ERP systems, Underground Innovation

Introduction

It's been nearly five decades since ERP systems were first introduced in organizations as inventory management systems (Gumaer, cited in Basoglu, Daim & Kerimoglu 2007). Through their journey from systems which could only offer limited functionality to a point where they came to be accepted as enterprise-wide solutions, ERP systems have played a pivotal role in changing the way organizations conduct their business. As these systems became increasingly popular due to the range of benefits they offered to organizations, there also emerged a whole new set of issues, for instance the complexity of implementation amply described in the literature. Today many organisations have been using ERP systems for more than ten years. Anecdotal evidence suggests there may be a number of issues coming to the fore in these mature ERP environments. This paper will examine one of these issues which has emerged in recent academic research on ERP systems, that of feral systems.

As ERP systems are implemented as enterprise wide solutions, there appears to be an increasing number of systems evolving which reside outside the purview of the ERP system and thus the organizational management which controls it. The development of these systems is usually facilitated by users who intend to circumvent the use of the organizational enterprise systems. This paper, drawing from the current academic literature available on feral systems and related topics, investigates feral systems, the motivation behind their development, their benefits and limitations and suggests how organisations might make the best of their perhaps inevitable presence. The paper also seeks to highlight gaps in our knowledge about feral systems. With the adoption of ERP

continuing to grow the authors believe there is an increasing need to develop a holistic view of these systems and an awareness of the likely presence of feral systems and how they might be managed.

The paper commences by seeking to define feral systems and the scope of applications which might be included. The factors which appear to contribute to the development and use of feral systems are then explored. Being outside the strict controls and governance of institutional systems it might be assumed that feral systems are inherently bad, but this is not necessarily so, and before looking at the limitations and dangers, we explore the benefits that can be gained from feral systems. We then outline and discuss strategies that organisations can pursue to alleviate the pitfalls of these systems. Finally we discuss the gaps in the research literature about these systems and the need for further study.

What are feral systems?

Feral Systems have been defined as an end user development phenomenon wherein end users covertly engage themselves in developing systems to assist them in their operational activities without the blessing or support from the top management and outside the purview of the organizational information systems (also cited as formal or legitimate systems) (Kerr, Houghton & Burgess 2007; Behrens 2009). Behrens (2009) contends that 'these systems replicate the data or the functionality of the formal systems which have been designed and installed to carry out the primary purpose of the organization as was understood at the time of installation'. Though there is limited research on feral systems, academic literature does contain several terms which bear a resemblance to feral systems such as 'Shadow Systems' (Behrens 2009), 'Work-Around Systems' (Koopman & Hoffman 2003), 'Underground Innovation', 'Tolerated Innovation', 'Forbidden Innovation' and sometimes 'SkunkWorks' (Kerr, Houghton & Burgess 2007; Abetti 1999).

The Oxford Dictionary describes animals as feral when they are in a wild state; or have returned to an untamed state from a state of domestication. Thus association of the term feral has been done primarily for two reasons: (1) these systems reside beyond the fringes of management control and thus beyond the influence of regulatory frameworks that tend to control the development, maintenance and usage of systems in the organizations and (2) some systems that were initially developed to satisfy specific users' needs, have grown extensively beyond anyone's comprehension and are now beyond control or outside the influence of anyone in the organization.

Current evidence in the literature suggests the existence of these systems in large organizational settings but fails to substantiate their existence in small and medium sized organizations. Large organizations in which these systems were studied include a higher educational institution in Australia (Behrens 2004), technology leaders (Fosfuri & Ronde 2009) and a large and prominent aviation company (Aucoin 1997; Teague 1991; Mischi 1999). There is no evidence regarding the type of organizations these systems might thrive in, nor any correlation with the organizational size. These questions might be addressed in future research but are beyond the scope of this paper.

In terms of type of applications, the current literature highlights applications such as medium size learning management systems (Behrens 2009), Access databases and some spreadsheet based reporting applications (Kerr, Houghton & Burgess 2007). Due to the limited literature available on feral systems, it is very difficult to determine if certain application types are more prevalent than others. Other questions that remain unanswered include whether feral systems are limited to a particular size in terms of functionality covered, the numbers of users, the ability to process specific volumes of data or the amount of resources consumed.

Factors motivating the development and continued use of Feral Systems

Drawing on previous studies there appears to be three motivations behind the development and use of feral systems.

Firstly as a workaround for organizational information systems that users perceive to be inadequate. The implementation of feral systems as a workaround has been widely discussed in feral systems research for instance Koopman & Hoffman (2003) define workaround systems as an endeavour wherein users alter input data or procedures to compensate for a system's shortcomings.

Drawing on Delone & Mclean's model (2003), we propose three quality aspects – System, Information and Service quality – as possibly influencing the development of feral systems as workarounds to compensate for the inadequacies of the formal systems.

System Quality includes the development of workarounds for systems which lack the required functionality or have an inherent design/software/hardware flaw (Koopman & Hoffman 2003). This can occur through the

implementation of packaged software applications, particularly in vanilla implementations which can be shown to lead to missing functionality as they do not always fit into organizational, industrial or cultural boundaries due to their limited configurability (Howcroft & Light 2006). According to Behrens & Sedera (2004), feral systems are seen as a way of filling gaps between the stakeholder expectations and the packaged software.

Missing functionality can also arise when the formal systems are found to have been championed by groups who have some vested interest in the system (Behrens & Sedera 2004). Their implementation tends to favour the needs of these groups rather than all users leading to missing functionality for some.

In some cases ERP systems have been found to be too rigid and the option to configure them to the organizational needs have been discouraged by the ERP vendors (Brehm, Heinzl & Markus 2001). It might be further thought that the complexity of performing such change to ERP systems, limited access to the source code, and high development and maintenance costs associated with the system often widens the gap between the desired and the available functionality associated with the ERP system (Brehm, Heinzl & Markus 2001).

A final Systems consideration is that the use of formal processes and procedures associated with organizational systems can lead to the systems being less user-centric and thus less responsive to user needs, leading to users developing their own systems (Behrens 2009). Thus the lack of collaboration associated with the formal systems often impedes the organizational endeavour to achieve the best fit with the desired functional requirements associated with the system.

The second quality consideration is that of the Information. This includes developing workarounds for systems which lack in terms of providing accurate, appropriate and timely information to users. Most of the literature on feral system shows that the incapability of the formal systems in providing the required quality of information to the users, acts as a major deterrent towards their usage. Moreover, the limited access to the required information due to the informational powers exercised by specific groups also significantly influences the timely availability of information from the formal systems (Ignatiadis & Nandhakumar 2007). The workarounds associated with addressing the information quality issue, often involve developing parallel applications which contain the correct functionality or manipulating the input data to get the desired result (Koopman & Hoffman 2003).

Service is the final quality parameter, and in this context refers to a prompt and a timely response to the user's queries and issues from those responsible for supporting the application, which may be the IS department or the system vendor. A good service quality is seen to be highly pertinent in ensuring positive user satisfaction towards the product (Delone & Mclean 2003).

While ERP systems often present a structured methodology and processes to conduct any development activities or repairs, the greater user proximity associated with feral systems ensures a timely completion and resolution of activities associated with user requests (Behrens 2009; Behrens & Sedera 2004). In the case of formal systems, the apparent lack of system flexibility in terms of addressing the requirements of the users in a timely manner tends to further fuel the user disillusionment about the quality of the service provided by the support group. Also the emphasis on providing services only to specific user groups in the organization owing to their greater influence may also lead to lower service quality.

The second major area of motivations we wish to consider are those relating to perceptual and social factors. In considering these we draw on a collective list of factors which emphasize the subjective side of technology acceptance by the users

Perceived Ease of Use is a Technology Acceptance Model (TAM) construct, proposed by Davis (1989), which is seen to have a strong influence on the intentions of users towards the feral system usage. Researchers (Behrens 2009; Koopman & Hoffman 2003; Behrens & Sedera 2004) claim users often grapple with the complexity and user "unfriendliness" of the formal systems, and look for avenues to devise simple and user friendly solutions which help them improve their job performance. The reasons behind the perceived "unfriendliness" of the system have been cited as inadequate system training, overall low computer literacy and a lack of organizational incentive to re-skill as some of the factors influencing the use of formal organizational systems (Koopman & Hoffman 2003). User training has been extensively mentioned as one of the critical success factors for ERP projects in the research on ERP systems as the lack of it has been found to inevitably derail the ERP adoption (Salimifard, Ebrahimi & Abbaszadeh 2010; Jarrar, Al-Mudimigh & Zairi 2000) while persuasion in terms of providing the users with incentives and compelling arguments has also been known to have positive effects on user adoption of ERP systems (Xia & Lee 2000).

Perceived usefulness, also a TAM (Davis 1989) concept, can be defined as a utilitarian experience which is goal oriented and emphasizes the functional performance of technology for task fulfilment (Deng et al 2010). Behrens (2009) and Behrens & Sedera (2004), present perceived ease of use, heavy organizational processes, low system flexibility and lack of collaboration as being some of the major factors impacting the user's perception on the system usefulness. Also factors such as loss of process control due to the usage of formal systems (Koopman and

Hoffman 2003), organizational bureaucracy (Fosfuri & Ronde 2009) and social norms further shape the perceptions of the users towards the system.

Social influence can be understood in terms of perceived social pressure to perform or not perform a particular task (Ajzen 1991). In this case, the motivation to disregard the use of formal systems has been seen to be sometimes driven by the social environment particularly the higher management and people with greater system knowledge or computer literacy. Kerr, Houghton & Burgess (2007) contend that low computer literacy at the operational staff level usually leads to more faith in systems developed by operational managers who have greater computer knowledge as compared to the rest of employees in a division. They also claim that lack of management incentive (in terms of head count reduction or establishing reward policy) to garner support for the formal systems also plays a strong role in influencing the perceptions of the system users.

The final motivator we will consider for the development and usage of feral systems is that of power tensions within an organisation. Power can be defined as the ability to influence the behavior of another (Lucas 1984). Markus (1983) claims that information systems embody a distribution of intra-organizational power among the key actors who intend to use it in face of opposition or resistance. Feral systems have been found to be at the centre of power struggle in organizations wherein individuals and subgroups are constantly vying to gain control over the limited organizational resources. Kerr, Houghton & Burgess (2007) contend that feral systems represent a general sense of unease with the legitimate systems due to power tensions existing between different interest groups in the organization. Power imbalances have been seen to have major implications as they tend to incite conflicts between the different interest groups within the organization (Fosfuri & Ronde 2009). Feral systems provide an avenue to the different groups to circumvent the power structure and gain back control over their tasks and activities.

Though power may be exercised through different channels, we will consider just two channels - Informational Power and Processual Power.

Informational Power is defined as a power which is exercised by chosen few through their ability to control and monitor information needed by others (Kerr, Houghton & Burgess 2007). This has been shown as a primary contributing factor for rising disillusionment amongst the users as limited access to information has been shown to lead to low sense of control and greater uncertainty in the processes. Also the panoptic features of the formal systems heighten the feeling of loss of control amongst the users further fuelling the disillusionment (Sia et al 2002).

Processual Power is essentially defined as power gained over the organizational processes through development of coalitions between interest groups and manipulation of information that the members employ in a struggle for power within the organization (Fincham cited in Boonstra & Vries 2005). Kerr, Houghton & Burgess (2007) contend that processual power acts as a major source of influence towards the development of feral systems as it provides an avenue to overcome the power tensions by circumventing the organizational information system so as to improve work processes by gaining a greater control over those processes.

Clearly there are significant motivations for the development and use of feral systems in many organisations. By definition such systems are beyond the grasp of most if not all governance practices within an organisation. It might therefore be supposed that they are inherently bad and should be strongly discouraged. In fact research to date on feral systems has identified a number of benefits that feral systems can bring to an organisation.

Benefits of Feral Systems

Firstly, feral systems can lead to a closer fit with user requirements. Feral systems are usually developed by or in close collaboration with the users, who are extensively involved in the design process of the solution (Behrens 2009). Moreover the ongoing closer association with the users ensures that all the user requests and changes are handled appropriately thus ensuring a greater adaptability and flexibility. This benefit clearly resonates in the literature of end user development (EUD) as EUD has been shown to reduce the communication gaps between the users and developers and facilitate better response to user requests (Sanders & Sipior 1989; Kreie et al 2000; Lawrence, Shah & Goulder 1997). Greater user involvement plays a strong role in ensuring the solution is the best fit for the business and user requirements.

Secondly feral systems can facilitate creativity and innovation. Behrens (2009) claims that when users perceive that a technology offers innovative qualities they are more likely to adopt it. The innovativeness of feral systems is often due to the fact that they are developed in close collaboration with the users. Closer collaboration of users with the system designers in the case of feral systems not only ensures that the users are aware of the capabilities of the technology being used but also in the subsequent stages the users might be able to realise the potential of the system in satisfying some of the other impending issues that they foresee (Wulf & Jarke 2004)

The association of the term skunkworks is primarily done due to the fact that these projects facilitate innovation. Another primary facilitator for innovation is the fact that these systems are developed outside the purview of the management control and hence able to avoid bureaucracy which might hinder the creative efforts of the users. Formal systems being seen as too rigid hamper the creativity of the users in that they structure the processes and provide the users limited options in terms of configuring the functionality to achieve innovation.

Thirdly feral systems can help to re-establish stability and order in times of organisation change. Organizations undergoing an implementation of an ERP system are often faced with large scale changes which may act as potential sources of resistance, confusion, redundancies or errors (Somers & Nelson 2001). An absence of a change management policy may aggravate these issues fuelling the development of feral systems which represent a process of reorganization in the face of chaotic situations (Shaw 1997). The development of feral systems as workarounds introduces fixes for the flaws or shortcomings in the formal systems. They may be awkward or clumsy but are temporarily effective in solving the issues arising in the formal systems. Moreover the greater control over these processes and the decentralized/informal nature of these systems ensures that often the requests associated with enhancements or repairs are resolved in a timely and efficient manner. This ensures that the core organizational processes are not stalled due to any glitches associated with the formal systems at any point of time.

Fourthly feral systems can reduce intra-organizational conflicts and power tensions. Kerr, Houghton & Burgess (2007) view feral systems as prime avenues to reduce power tensions in the organizations. The implementation of solutions which obviate the use of formal systems and reduce the dependence on the others ensures that special interest groups have greater control over their processes and are not involved in the power conflicts in the organization. Moreover equal distribution of the informational power between interest groups empowers all the groups to avoid uncertainty and thus be less dependent on others for their information needs.

Fifthly, Fosfuri & Ronde (2009) claim that feral systems facilitate healthy competition in organizations by preventing the concentration of power in the hands of a chosen few. This leads to better utilization of resources in the organisation and potentially greater efficiency.

While users and even some managers might perceive feral systems as beneficial, there is quite a contrary view from an organizational perspective which has a clear view of the risks and limitations associated with the proliferation of these systems.

Limitations of Feral Systems

Firstly the development of feral systems can lead to system and data issues. Since feral systems are often used for the manipulation of organizational data outside the formal systems, redundancy of data and its integrity should be a cause of prime concern for the organizations. Though the feral systems literature doesn't raise this concern, the issue is highly cited in the end user development literature as outlined below.

Whilst users lack the conceptual knowledge of formal system development processes and technical know-how for developing the applications, they are often tempted to develop their own systems (for reasons suggested above). But this lack of knowledge prevents them from successfully transforming the working knowledge of the organizational environment into computer process-able form (Ngwenyama 1993; Behestian & Van-Wert 1987; Kreie 2000). Koopman and Hoffman (2010), make use of the term *kludge* to describe a workaround system which is awkward or clumsy but temporarily effective and whose design is of questionable elegance or downright ugly. Feral systems are sometimes known to exhibit these qualities due to the informality associated with the development of these systems.

Data quality is also of prime concern in feral systems as users often extract the data from the formal systems and manipulate it in parallel to or instead of in the formal system (Kerr, Houghton & Burgess 2007; Kerr & Houghton 2008). This can lead to the data being out of sync with the formal systems as the users may not perceive the need to integrate it back into the formal system for operational, forecasting or knowledge management purposes. Furthermore the questionable integrity of the data with respect to the rest of the organizational data may not represent the true state of the business. This has implications in terms of its tactical and strategic use (Behrens & Sedera 2004). In addition the expanded use of databases increases the probability of erroneous updates, violations of privacy and security rules, and of other criminal acts (O'Donnel & March 1987).

Feral systems often lack a backup and recovery plan. The informality of these systems often translates into lesser emphasis on the development of required documentation supporting the code. This leads to what Behrens (2009) cites as the "Hit by a Bus" scenario wherein something disastrous happens to the person developing or maintaining the system. Thus there is often no chance of medium to long term recovery as the key knowledge is lost with no trace of supporting documentation to recover the failed system. This is a cause of major concern as it

may have a paralysing effect on the departmental operations as the users are reluctant to use the formal systems to achieve their tasks.

Feral systems lack organizational visibility. Most of the literature on feral systems, shadow systems and skunkworks highlights 'secrecy' as being highly essential for ensuring their continued usage in organizations. Despite feral systems being beneficial to users they might act as a source of disadvantage to the organization in terms of derailing their efforts to leverage the use of the current formal systems to achieve their goals. Thus organizations need to evaluate the effects of these systems on the organizations and take apt measures to reduce their ill-effects. But the 'shroud of secrecy' associated with these systems makes it difficult for the management to assess the extent of their proliferation and hence evaluate their overall effects on the organization. Moreover the poor visibility of these systems in the organizational context (Behrens 2009) makes it difficult for the management to realise the benefits of these systems and discount these systems as being of no value to the organization.

Feral systems may act as a source of political conflicts. Despite the fact that feral systems tend to reduce the power conflicts in the organizations, they may also act as a potential source of political wrangling in the organization. The management and the IT department usually disapprove of these systems due to the informality surrounding them (Behrens 2009). Moreover the general stigma and misunderstandings related to these systems are seen to lead to factional warfare between the management, IT Department and the feral systems users. These conflicts often lead to increased efforts by management to gain control over the systems and bring them under the purview of the IT Department. This can potentially paralyse the systems by subjecting them to direct or indirect manipulation and marginalize all those connected with them.

Feral systems may not integrate with other organizational applications. The increased proliferation of feral systems offers a significant challenge in terms of integrating them with each other and with the formal systems. The secrecy and the informality associated with the development of these systems often leads to the development efforts being uncoordinated and thus hampering interaction and interoperability of these systems.

Feral systems may undermine the benefits of the formal systems. Most of the literature on feral systems cites them as an outcome of an ERP system failure to provide the benefits promised at the start of the implementation. But the literature offers limited evidence of the role of feral systems in undermining the benefits of the formal systems, though the literature gives telltale signs of feral systems being a contributing factor.

To better understand how this may occur, let us reconsider the benefits commonly expected to flow from an ERP system implementation. Gattiker & Goodhue (cited in Hitt, Wu & Zhou 2002) categorize ERP system benefits into four areas:

1. Improved information flow across sub-units through standardization and integration of activities.
2. Centralization enabled of administrative activities such as accounts payable and payroll.
3. Reduction of information systems (IS) maintenance costs and increased ability to deploy new IS functionality.
4. Transformation enabled from inefficient business processes toward accepted best business practices.

As feral systems are covert systems developed by users to circumvent the formal systems and improve their operational processes, they offer limited possibilities in terms of standardizing data and achieving organizational integration. As data is processed outside the purview of the organizational system, these systems are not subject to controls and business rules which ensure that the data is standardized across the organization. Moreover departmental or divisional operational efficiency is of prime concern as opposed to achieving the data standardization or system integration. This further limits the possibility of achieving centralized processes as these systems operate on the fringes of the formal systems and have manipulated data that is not consistent with the current data in the systems.

ERP systems enable the organizations to implement best practices, which may be the prime motivation for the organizations to implement these systems. As the users resist the use of these formal systems, they develop applications which they perceive would enable them to implement business practices that would improve their operational efficiency. In fact these may lead to users following inefficient practices which might wither away the competitive advantage that the organization hoped to gain from the ERP system.

Since there are clear set of benefits and limitations associated with feral systems, there is the potential to create a dilemma in the minds of the management as to what approach is the most appropriate to leverage the benefits associated with these systems and at the same time reduce the related potential risks and limitations.

Making the most of feral systems

As there may be a certain amount of inevitability in the emergence of feral systems, organizations have to strike a balance between the dogmatic and liberal approaches so as prevent the end user development efforts being tagged as *Feral* with all the negative connotations described above.

It is suggested that Management should shed the stigma associated with feral systems. Despite the general conceptions related to feral systems and overall tendency of management to tag them as a nuisance for the organizations, there is a dire need to see the systems for what they are (Behrens 2009). It is really important for the organizations to acknowledge the importance the users associate with these systems and understand the reasons why they were developed. This might expose some innovative practices developed by the users which might enable the organization to differentiate their services or it might expose some of the flaws inherent in their current systems (Behrens 2009).

It is recommended that Management should look to bring feral systems into the mainstream information system infrastructure. Behrens (2009) advocates bringing good feral systems into the mainstream instead of uprooting them, by identifying innovations and fostering conditions that give rise to them. The prime motive behind this being the fact that due to diversity both across and within organizations, capitalizing on a system which grows from within may be more likely to hold the key for true strategic and competitive advantage. But bringing the feral systems in the mainstream has its share of challenges.

Organizations also have to take a due cognisance of the informality of these systems and ascertain as to what level of management control the systems should be subjected to in order to generate the benefits from their usage and at the same time maintain the loyalty of the users towards it. As viewed in the previous sections, excessive control would tend to incite resentment amongst end users. Management have to recognise the fact that the informal side of the organization is the place where feral systems thrive and formalizing or controlling them might cause them to wither and die (Behrens 2009). As the management walks a tightrope between practising too much control and taking a “hands off” approach, there may not be a clear one-stop solution to determine the degree of control the management needs to exercise over these systems. The extent of control that the management would want to exert would depend on the benefits that the organization intends to gain from their IT infrastructure.

Management should look to resolve the pitfalls associated with good feral systems. While organizations acknowledge the value of the feral systems for the users and for the organizations, there is a need to address obvious technical limitations that may be associated with a feral system. Guimaraes, Gupta & Rainer Jr. (1999) propose the establishment of information centres (IC) to support end users who are limited in their level of computer knowledge and computer skills. The primary responsibilities of these information centres would be to conduct training for the end users, supply them with better infrastructure and provide consulting and technical support services. This would ensure best practices are inculcated during the development of the systems and hence obviate the issues of data integrity, poor documentation, lack of security, poor design and other associated technical issues.

Management should look to promote an environment of collaboration and co-creation. Fischer et al (2004) advocate the importance of participation of end users in the creative process of system design wherein all the stakeholders reach a shared understanding by contributing their different points of view and knowledge. This leads to the creation of new insights, new ideas and new artefacts due to the process of collaboration. This would not only prove to be useful in ensuring that the ERP implementations are aligned to the user’s requirements but also ensure that the end user developed applications cater to the needs of the maximum number of end users in the organization.

Fischer et al (2004) also advocate adopting an open source development approach for end user developed applications wherein a community of developers collaboratively develop systems to solve problems of shared interest and for mutual benefit. In this approach the designers do not provide a complete solution to the problem but provide a seed that can be evolved into a complete solution. The subsequent collaboration and creative insights provided by the rest of the users proves to be pivotal for an effective and innovative system that satisfies the all the needs of the users.

Looking forward, service oriented architecture may reduce the negative issues of feral systems. There has been an increased interest in the concept of service orientation as it aims at leveraging technology in response to the growing need for greater business integration, flexibility and agility (Demirkan et al 2008). It is a new philosophy wherein customer/user plays a central role in deciding what services the technology should render so as to satisfy the requirements of their tasks and responsibilities (Ordanini & Pasini 2008). It epitomizes the idea of service co-production due to the key role played by the business customer in planning the system and

assembling different modules over time. The platform, vendor and language independence ensures that any third party or end-user developed applications are easily integrated into the main system (Dörner et al 2008), which provides the impetus for management to integrate the disparate feral applications developed by the users. Moreover the integration ensures that these applications can be re-used and there is no redundancy across the organization. Finally the user-centricity in the implementation approach would ensure a greater requirement fit and a better user support for the organizational information systems.

Conclusion

Systems that an organisation might initially regard as feral can give value to an organisation. IT Managers need to develop an understanding of these systems and view them from a neutral standpoint. While the development and usage of feral systems presents a threat to the organizational information systems, they also provide an avenue to the management to explore gaps in their current enterprise systems and develop an understanding of the environment that is allowing or encouraging these systems to develop. The motivations behind the development of feral systems clearly substantiate the fact that the pitfalls associated with enterprise solutions are primary motivators for their development. At the same time users should be made aware of the limitations of feral systems and how they may impact the organization and its IT policies. While this research paper doesn't suggest any quick solution to alleviate the risk inherent with feral systems, it does provide recommendations drawing from the current academic research in the ERP domain.

There is in fact limited research on feral systems. While the existing research provides evidence of the existence of these systems in large organizations, there is no research on feral systems in small and medium enterprises. It may be helpful to build up a profile of organizations where these systems are prevalent by exploring the organizational culture, the structure, industry type, employee characteristics and systems formally deployed. This might enable a much better understanding of the conditions where these systems thrive.

It is also pertinent to develop an understanding of the type of applications that are usually developed as feral applications. Analysing as to what applications are more prominent than others would intend to highlight deficiencies of the organizational systems in providing the required functionality to the users. Moreover there is also a potential to determine if feral systems are limited to a particular size in terms of functionality covered, numbers of users, ability to process specific volume of data or the amount of resources consumed. This has a potential to generate a better profile of these systems and thus better understand the impact of these systems on organizations.

As the literature suggests there is strong support by users for feral systems, it might be helpful to develop a demographic map of these users. For instance profiling users by age group, seniority, educational qualifications, level of experience in the organization and in using the formal systems, and PC literacy may be helpful. An analysis of behavioural and social patterns would also enable the researchers to clearly highlight the traits of the users involved in the development of feral systems.

As the motivations behind the development of feral systems highlight system deficiencies as one of the primary motivators of feral systems development, the analysis of how ERP systems evolve over a period of perhaps a decade from implementation might also prove fruitful. For instance do they become more aligned to the business and user needs? Does data accuracy improve? Or on the contrary do they stagnate, and gradually slip in terms of alignment as new business initiatives evolve without consequent development of the system? Does data accuracy actually deteriorate after the first flush of implementation and rigour? If the latter, the rise of feral systems would seem inevitable as users strive to do their work. On the other hand, does the initial dissatisfaction with a new and unfamiliar system coupled with the inventiveness of users lead to the advent of feral systems which then contributes to the slippage of the enterprise system? While this research paper tries to portray a clear picture of feral systems as they are currently understood, there is a need to further explore this phenomenon and gain a fuller understanding so that managers of formal systems can make the most use of human creativity in the service of their organisation.

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