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Critical Realism, Multidisciplinarity and Methodological Pluralism: A Systemic Approach to Guide Information Systems Research and Practice

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ABSTRACT

Information Systems (IS) diffusion in small and medium enterprises (SMEs) depends on various levels of networked, localised, and evolving determinants, such as the ones related to the adopter organisations, decision-takers, technologies, buyers, professional groups, higher education institutions, complementary innovations, and government policies. This complex view of IS implies the use of different disciplines and methodologies to study the diffusion process. The objective of this empirical research is to demonstrate how the philosophical stance of critical realism (CR) and the systems of innovation approach (SIA) for organising research are compatible, and address the multidisciplinarity and methodological pluralism required to move on the research of complex IS and recommend meaningful actions to practice. To exemplify our arguments we focus the study on one relevant determinant that affect the diffusion of IS in SMEs, namely public programmes.

Keywords

Information systems research and practice, critical realism, systems of innovation approach, multidisciplinarity, methodological pluralism, SME policies.

INTRODUCTION

The diffusion of IS in SMEs is a systemic process which requires the coordinated activity of numerous participants far beyond the adopter organisation (Vega, Chiasson and Brown, 2007, 2008), as well as the adoption of complementary innovations by many of these participants (Vega, Chiasson and Brown, 2010). However, mainstream IS research has basically focused on discrete aspects of organisational and micro-environment factors of adoption (e.g. Fichman, 2004; Jeyaraj, Rottman and Lacity, 2006). We argue that the diffusion of IS in SMEs has to be approached with the deep ontological base of CR and the framework of the SIA to study innovation processes. The compatibility between CR and the SIA stresses the need of using multiple disciplines and methodologies in order to research and inform practice in the area of complex IS.

There have been few attempts to apply CR to IS research. Most of them have been conceptual discussions on how CR can overcome the inconsistencies of the positivist, interpretivist, and postmodernist research practices (e.g. Dobson, 2001; Mingers, 2004). There were also few efforts to connect CR and the SIA from a generic perspective (e.g. Castellacci, 2006; Iliev, 2005), and not in terms of IS.

This study focuses on one relevant determinant of the system of innovation for the diffusion of IS in SMEs, specifically public programmes (Vega et al. 2007, 2008). The theme is even more relevant if we consider that our empirical work demonstrated that both the assistance and the adoption attempts were negative. This comprehensive research inquires from the micro aspects of IS innovation in the SMEs until the macro structures in the policy system. The paper starts with a revision of the foundations of CR and the SIA, as well as the ontological and epistemological commonalities between them. After this, we explain the aim, theories, research design, and findings of each stage of the research process. We conclude summarising the correspondence between the IS phenomenon under study and the critical realist and systemic perspectives.

CRITICAL REALISM

CR (e.g. Archer, Bhaskar, Collier, Lawson and Norrie 1998; Bhaskar, 1989; Sayer, 1992) states that there is a concrete and mind-independent reality that has real consequences on the perceptive and cognitive functions of social actors. It means that CR is a compromise between the two extreme philosophical positions, namely positivism and interpretivism. For critical realists, the world operates at multiple levels, and each level has the capacity of affecting other levels in complex and localised ways, for example the individual, the organisation, the micro economy, and the policy system. Also, the real world is open and changes over time given the human agency in the reproduction and transformation of social structures and causal mechanisms. Consequently, both the knowledge-creation process and research become ongoing and time-dependent activities. For these reasons, in order to explain and control the tendencies of events in the social world we have to

understand the underlying processes of often temporal, counteracting, and contingently-related structures and mechanisms that give rise to these events.

THE SYSTEMS OF INNOVATION APPROACH

The SIA was developed on the basis of innovation research and institutional and evolutionary economics (e.g. Lundvall and Borras, 2005). It is also related to general systems theory (e.g. Edquist, 2005). The SIA is a conceptual device, which includes 'all important economic, social, political, organisational, institutional, and other factors that influence the development, diffusion, and use of innovations' (Edquist, 1997, p. 14). Under the SIA, innovation is defined as an open, interactive, and non-linear learning process (Lundvall, 1992), which is affected by the capabilities (e.g. trust, power distribution, and cooperative relations) and accumulated knowledge in organisations, firm networks, and communities. Reciprocally, the capabilities and accumulated knowledge vary locally as a result of learning trajectories driven by societal actors (Asheim and Isaken, 2000). Thus all this complexity creates uncertainty around innovation activities. Finally, private or public interventions should be based on the detection of problems and the subsequent identification of causal explanations at any part of the system, namely system failures (Edquist, 2001), for instance the inappropriateness or missing of actors, institutions, or linkages.

A COMMON EPISTEMOLOGY

As we can appreciate, CR and the SIA have similar ontological bases. Basically, a social phenomenon is non-predictable because it depends on a complex, stratified, and localised array of determinants. Furthermore, a social phenomenon is dynamic given the openness of its causal constituents and the transforming effect of human activity. Accordingly, CR and the SIA entail a similar research epistemology. We turn next to explain four aspects that support this view.

Focus of Study

Both, CR and the SIA are expressly committed to research the underlying generative structures and mechanisms, e.g. system of actors, institutions, and linkages, that determine the surface events, e.g. innovation outcomes. The imperative is to go to deeper levels by searching the processes that provoked the observed evidence. Therefore, the aim of research is to identify the enrooted complexity of the object of study as a means to recommend strategic actions to improve social conditions.

Research Approach

CR and the SIA need a starting point for analysis. Lawson (1997) calls demi-regularity to the partial regularity of an observable event which at first sight indicates the occasional, but less-than-universal, state of generative processes over a specific time and space. The SIA uses appreciative theorising (Nelson and Winter, 1982) so as to explain demi-regularities through theoretical abstract reasoning. The main objective is to produce typological theory, in which the explanation of each demi-regularity is idiosyncratic but developed in terms of general variables (Christensen, 2006). The movement from the observable events to the buried generative processes is named retroduction by CR scholars (Sayer, 1992).

Multidisciplinarity

According to CR and the SIA, reality is driven by complex, stratified, and open systems, therefore, the social realm is an intricate interconnected whole. As a consequence, the explanation of a phenomenon necessarily requires the understanding of the formation and simultaneous effects of different interacting determinants, which can be constitutive elements of different disciplines. For example, psychology and business studies are relevant at company level. Microeconomics and network theories explain much of the sector behaviour. Similarly, institutions and political sciences deal with aspects at higher levels of society.

Methodological Pluralism

Although the metatheoretical stance of CR is the guide for the whole research process, the selection of data collection and analytical methods requires a deeper ontological perspective. It implies that a study could employ various methods, which are derived from various ontological assumptions of the parts of the social realm under investigation. Correspondingly, the use of appreciative theorising by SIA scholars entails an explicit linkage between observable data and underlying theory as well as between different methods. A researcher should identify relevant and easy-to-access demi-regularities as entry points. As a result, the researcher could decide not only the theoretical disciplines to continue the study but also the most appropriate methods of inquiry.

THE DIFFUSION OF IS IN SMEs AND PUBLIC PROGRAMMES

This section explains the aim, theories, research design, and findings of each stage of the research process. We start with an exploration with the purpose of identifying a relevant demi-regularity, i.e. the poor assistance of public programmes. After this, we address the issue of discretion at programme implementation level, as well as develop a typology of programme contexts in order to explain the choice of goals of their workers and the potential for success in terms of service quality and evaluative targets. Finally, we exemplify the numerous systemic issues that had to be studied so as to get a better explanation of the underlying structures and mechanisms that affect programmes and, consequently, the diffusion of IS in SMEs.

Exploration

The aim of the exploration was to define the specific research topic and questions. The research approach was purely inductive and based on three organisations that deliver public assistance to IS adoption in SMEs. We did unstructured interviews with the programme managers and read secondary data about the programmes, the policy system around the programmes, and a few of their interventions. We appreciated that some contextual aspects could have negatively influenced both programmes and SMEs, including the excessive discretion of programme workers, evaluation mechanisms, the availability of resources, the demand for programme services, and the characteristics of the adoptions that were assisted. As most of these aspects are determined in the system, and not within programme organisations, we suspected that these conditions were quite common and somehow enduring. For these reasons, we considered a relevant demi-regularity to the potential poor assistance of this kind of programmes. The consequent research questions were as follows:

- What is the nature of programme interventions?
- What are the nature and consequences of programme contexts?
- How could programme contexts be improved?

Nature of Programme Interventions

This stage of the research addressed a long-standing debate in the political science and public administration fields, namely the existence and effect of discretion at policy implementation. On the one hand, we have the view of the defenders of the existence of discretion as a consequence of the complex work of programmes, the dependency of policy-makers and programme managers on programme worker activity, as well as poorly-defined policies and procedures (e.g. Lipsky, 1980). In this situation, public policies tend to be made as much from the programme workers as from policy-makers (e.g. Lindblom and Woodhouse, 1993; Lipsky, 1980). On the other hand, we have the view of the advocates of a shift in power in favour of policy-makers and programme managers as a result of effective policies and procedures (e.g. Howe, 1991).

We used a deductive approach based on the replication of six case studies (Yin, 2009) of programme assistance and on the pattern matching analytical method (Trochim, 1989). The replication structure considered cases with known outcomes in order to confront rival explanations. Doing so, we discarded the reductionist stance because excessive discretion was present in practically all the cases. For example, instead of delivering high level knowledge transfer from the academics of the department of computing to information technology (IT) SMEs, a programme delivered traditional IS services using third-party service providers to a non-IT SME.

After that, we went deeper into the contextual data with the intention of understanding the underlying causes that gave rise to excessive discretion. Our findings are illustrated in figure 1.

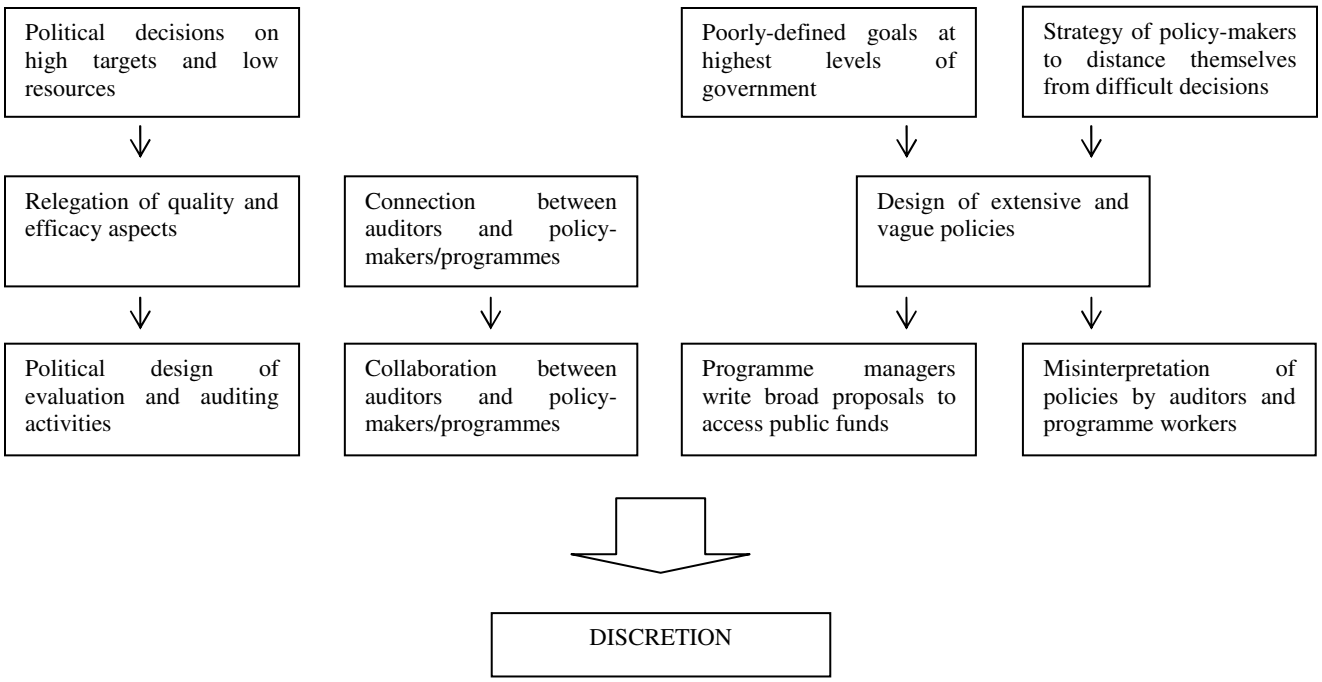

Figure 1. Contextual Influence on Discretion

In principle, there is a policy-making imperative of delivering a high quantity of services but being very efficient in the use of resources (e.g. Lewis and Glennester, 1996). In this situation, the quality and efficacy of the services would be relegated to a secondary level of relevance. Accordingly, the evaluation and auditing activities were designed to focus on politically relevant issues. For example, a typical indicator was the ratio between funding and SMEs assisted. Other probable cause for discretion is the bottom-up collaboration of auditors with policy-makers and programmes (e.g. Storey, 2006). Correspondingly, funding bodies commissioned the administration of the deployment of funds, including programme auditing and control, to organisations that took important roles in designing the policies or that were connected to the programme organisations. For instance, a university association audited the programmes implemented by their members.

Discretion could also be facilitated from top to bottom if we take into account that some policy statements were very extensive and vague. For example, a long policy had many contradictory statements, including 'advanced research and development and knowledge transfer' and 'websites'. This could be a consequence of poorly-defined goals at highest levels of government (e.g. Hasenfeld and English, 1974). Policy-makers could also use broad policies as a strategy to distance themselves from the consequences of the decisions to balance demand, needs, and resources (e.g. Wells, 1997). The broadness in policy definition had been exploited by programme organisations to formalise discretion when they write broad proposals for the selection process to access public funds. Finally, another risk is that auditors and programme workers could misinterpret the numerous and unclear phrases of the policies, which could have allowed public interventions to escape even from broad policy statements (e.g. Lewis and Glennester, 1996).

Given the excessive discretion identified in the cases, it is important to research in detail the work context and potentially competing priorities of programme workers.

Nature and Consequences of Programme Contexts

The aims of this stage of the research were to explain the context and performance of public programmes. Here, the study was based on a collective structure (Stake, 2005) of six case studies of programme assistance and the inductive analytical method suggested by Easterby-Smith, Thorpe and Lowe (2008). The collective structure required the selection of a varied and balanced group of cases that were believed to offer the greatest potential to learn and develop theoretical constructs, for example cases with programme organisations with different operating structures, programmes funded by different funding bodies and offering different types of services, as well as assistance to different types of SMEs and IS. The six cases are the same than the ones in the previous sub-section, but at this stage we are interested in the contextual aspects that influenced programme worker behaviour, and not discretion.

We defined a typological classification of programme contexts based on the modification and grouping of the contextual components of public services of Lipsky (1980). These interrelated components include the formal evaluation mechanisms of programme assistance, power between programmes and SMEs, access to resources by programmes in terms of time, knowledge, information, and budget, level of demand for programme services, programme worker alienation due to any job monotony or limitation, and competition between SME, social, and programme goals. So, this part of the research represents an hybrid research approach because there was an initial guiding theoretical framework but the development of our theoretical construct was completely induced from the data.

To begin, we defined two determinants to classify programme contexts, namely evaluation result and goal moderator. Evaluation result is determined by the interaction of evaluation and power. A positive influence occurs when the result shows what actually happened in the adoption and assistance processes. A negative influence occurs when the evaluation does not show what happened. For instance, let us consider that the formal evaluation is the quantification of the increase in sales in the SMEs after the programme interventions. Clearly, the increase in sales could be caused by different changes in the SMEs or the market, but not necessarily by the programme assistance. Additionally, if the SMEs depend on further public assistance to carry out their strategic activities, there would be an imbalance of power in favour of programmes. In this case, the evaluation will tend to please programmes independently of the quality of the interventions. We argue that the evaluation result influences the focus of programme workers on SME, social, or programme goals. In our example, there would be a tendency to address programme goals, i.e. quantitative targets.

The goal moderator is defined by the interaction of resources, demand, and alienation. A positive influence occurs when all the contextual components that form the goal moderator do not present problems. A negative influence occurs when at least one of these components presents problems. For instance, let us consider that because of financial restrictions a programme has a short time to service each SME. In this case, the goal moderator will be a negative influence because this problem compromises the delivery capacity of the programme. We argue that the goal moderator can determine the extent in which non-focused goals are addressed. In our example, and assuming that the focus is on programme goals, the tendency would be to select SMEs with ambitious growing plans in order to reach the quantitative targets. Therefore, it would be a matter of coincidence if the programme can deliver proper services to some of these SMEs in order to address SME or social goals. The probability of this coincidence will be low if the programme has a poor delivery capacity.

With the combination of the two determinants and their two values we constructed a classification of four types of programme contexts, see table 1. The objective is to explain the choice of goals of programme workers and the potential for success of programmes in terms of service quality and evaluation targets. In the previous two paragraphs we already explained the type chaotic. With regard to the type misleading, the predominance would be for programme goals. This is because of the freedom of action allowed by negative evaluation results and because programme workers would try to surpass the quantitative targets to have the greatest chance of succeeding in the next public funding rounds. Given the better response situation of this type of programmes in terms of the goal moderator, there would be more coincidences among goals in comparison to the type chaotic. The type optimum is the best condition in which positive evaluation results force programme workers to choose social goals and programmes are well-prepared to face this challenge. Finally, in the type unsustainable, positive evaluation results oblige programme workers to opt for social goals. However, given the poor goal moderator, there would be low probabilities to select a great number of SMEs to deliver proper services.

Evaluation Result	Goal Moderator	Type	SME Goals	Social Goals	Programme Goals
Negative	Negative	Chaotic	If it coincides with the programme goals - Very few times	If it coincides with the programme goals - Very few times	Tendency
Negative	Positive	Misleading	If it coincides with the programme goals – Sometimes	If it coincides with the programme goals - Sometimes	Tendency
Positive	Positive	Optimum	If it coincides with the social goals – Sometimes	Tendency	If it coincides with the social goals - Sometimes
Positive	Negative	Unsustainable	If it coincides with the social goals - Very few times	Tendency	If it coincides with the social goals - Very few times

Table 1. Programme Context Types and Goal Selection

We found that the type chaotic could be the most common programme context. The reasons for this worrying situation are (i) that most of funding bodies set flawed evaluation mechanisms, (ii) that SMEs tend to depend much on external support, (iii) that there is a policy-making imperative of providing little resources but setting high targets, (iv) that there is a low inherent demand for SME innovation services, and (v) that there is the possibility of alienation of programme workers as ultimate consequence of using insufficient resources and poor evaluation mechanisms. In fact, these reasons can explain the deficient outcomes that we found in the adoption and assistance processes. These arguments emphasise the relevance of immersing even more in the system in order to research how to improve programme contexts.

Improvement of Programme Contexts

This stage of the research was another exploration. The aim was to identify the systemic issues that could help to improve the components of programme contexts, i.e. evaluation, power, resources, demand, alienation, and goals. To do so, we gathered additional information, for example via semi-structured interviews with regional IS policy managers and the managers of different programmes, the reading of diverse academic research, IS policy initiatives of different regions and sectors, and various economic policy documents.

Table 2 shows some initiatives that have to be developed in the system of innovation. For instance, funding bodies are in charge of defining the evaluation design. Another example is the issue of SME empowerment. This initiative could be tackled directly by the SME associations. The systemic initiatives could also be interrelated, which would create even more complexity. For instance, correctly empowered SME groups could influence funding bodies with the aim of changing the evaluation design. As explained, all the initiatives ultimately affect the choice of goals of programme workers. Importantly, all these systemic issues have their own underlying generative structures and mechanisms. This implies that to study each of these initiatives, we would have to consider their particular theoretical fields, ontology, and research methods.

Suggested Initiative	Explanation	Programme Context Component Affected
Adoption and assistance process evaluations	In order to improve the evaluation design, the methods should be qualitative and the focus should be on the outcomes of adoption processes and the analysis of each programme action and inaction	Evaluation
Third-party evaluators	In order to avoid conflicts of interests, evaluators should not be connected to the programme organisations, the policy-making teams, or contracted by any of these parties	Evaluation
SME empowerment	In order to have an influencing presence at all levels, SME representatives should improve their involvement in the design, administration, and evaluation stages of the public service process	Power
Marketing competition simulation for programmes	In order to avoid the dependency of SMEs on a single programme organisation, a group of programme organisations should offer similar services in the same geographical area	Power
Sector and functional area focused services	In order to get knowledge and expertise, programme organisations could continually deliver services to the same sectors and functional areas	Resources
Consultancy accreditation	In order to guarantee knowledge and expertise, programme organisations could opt to accredit their practices through rigorous academic and practical assessments	Resources
Awareness campaigns	In order to trigger the agenda-setting in SMEs, coordinated IS policies should include campaigns to increase the demand for IS and programme services	Demand
Simplification of contractual procedures	In order to start programme operations on time and have better chances to reach targets, the procedures of the policy administrators to sign contracts should be shortened	Demand
More comprehensive set of services	In order to make programme workers to participate more in each SME adoption process, programmes should deliver services that cover most of the SME needs	Alienation
Modification and reduction of numerical targets	In order to make programme workers to participate more in each SME adoption process, the targets should be more qualitative and any numerical indicator should be reasonably ambitious	Alienation

Table 2. Systemic Initiatives Affecting Programme Context Components

CONCLUSIONS

This study centred on the compatibility of CR and the SIA to research complex IS and inform practice, specifically for the diffusion of IS in SMEs. The initial exploration uncovered a relevant demi-regularity, namely the poor programme assistance to IS adoption processes. Then, we found excessive discretion at programme implementation level. This could be explained by the political design of the evaluation and auditing activities, the collaboration of auditors with policy-makers and programmes, the exploitation of extensive policies by programme managers, and the misinterpretation of vague policies by auditors and programme workers. The excessive discretion made relevant the study of the context and priorities in programmes. Therefore, we constructed a typological classification of programme contexts to explain the choice of goals and the potential for success in terms of service quality and evaluative targets. We defined two determinants to construct the typology. One describes the correctness of the evaluation results and the other the delivery capacity of programmes. As the

worse programme type seems to be the most common, we decided to explore the ways to improve programme contexts. Thus we identified a list of interrelated systemic initiatives that could contribute to this.

In general, the research gives a clear vision about the complex, stratified, and open nature of public programmes and, consequently, of the diffusion of IS in SMEs. In fact, IS diffusion in SMEs does depend on systemic issues as distant as consultancy accreditation led by professional groups or the decisions on programme targets made by politicians. We used theoretical components that are not utilised in mainstream IS research, specifically the framework to explain discretion and the programme context components, which come from political science and public administration areas. The SIA itself comes from innovation research, institutional and evolutionary economics, and general systems theory. In addition, we used a combination of inductive, deductive, and hybrid research approaches to carry out the multiple levels of the study, which reflects a deep ontological variety. The multidisciplinarity and methodological pluralism required to study complex IS become even more diverse if we take into account the systemic issues recommended to improve programme contexts.

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