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Furthering Distributed Participative Design

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Unlocking the walled gardens

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Abstract. Participatory design (PD) and its derivative distributed participatory design (DPD) are examples of collaborative research methods that have been successfully applied to information systems problems. Yet, there are other collaborative research methods such as action research and design science that have also been used in the same context. This paper argues that this trifurcation in collaborative methods is unhelpful and that the 'walled gardens' in which these methods exist inhibit learning and the methods' development. As PD moves to tackle the problems that arise in distributed projects, it becomes more necessary to look outside its own domain for solutions. This paper investigates whether collaborative research projects that are categorized under one method also match the characteristics of the other methods. It finds that research projects using different methods demonstrate remarkable similarities concerning research contributions, roots, and methodological guidelines, but use different terminologies, and also maintain method-specific publication outlets and communities. Thus, insight into some of the issues raised by participatory design in distributed contexts may arise if PD looks outside its walled garden.

Keywords: Participatory design, action research, design science, text analysis.

1 Introduction

In its initial form, participatory design (PD) was developed in locations where users and designers physically met. While this was common for most IS projects at the time, technological developments now allow the use of virtual teams that may be distributed across time and space. Distributed PD poses new problems. However, while there are suggestions that PD could gain from research in computer supported co-operative work, this paper argues that there are other collaborative research methods that may also offer useful experiences. Distributed PD needs to look to distributed action research (AR) and distributed design science (DS) as its antecedents as well as from within itself. As a start, this paper investigates the similarities exhibited by PD, AR, and DS. The notion of 'walled gardens' is well established in information systems with debates as to the nature and extent of the 'problem' (Holmstrom 2005). Walled gardens are domains that have rich internal inter-linkages but lack links to and from the rest of the network (Labrogere 2008; Foros 2007). Information flows within walled gardens are constrained and thus learning from other gardens is limited. Clearly, any domain has the potential to learn from any other. Niehaves (2008), for example, questions if there is a dominance of positivistic thought or just that journals tend to publish it, and asks if design-oriented research prefers other outlets. However, if it can be established that approaches have significant commonalities then this points to fertile soil where exploration might commence.

Many scholars have called for more collaborative research approaches and methods to increase practical relevance (Daft and Lewin 1990; Deetz 1996; Avison et al. 1998; Benbasat and Zmud 1999; Lee 1999; Dennis 2001; Hirschheim and Klein 2003) and the theoretical contributions of research efforts (Daft and Lewin 1990; Davenport and Markus 1999; Lee 1999; Kock et al. 2002; Van de Ven and Johnson 2006). AR is probably the most prominent and widely-quoted collaborative research method (Orlikowski and Baroudi 1991; Baskerville and Wood-Harper 1998; Baskerville and Meyers 2004; Davison et al. 2004). More recently, PD and DS have been applied as methodological grounds for involving practitioners and fostering relevance for practice (Hevner et al. 2004; Kensing et al. 1998a; Baskerville 2008). The three methods are frequently applied to understand system development, change, adoption, use, and acceptance by practitioners (Avison et al. 1999; Baskerville and Meyers 2004; Hevner et al. 2004).

Even though PD, AR and DS all imply collaboration between researchers and practitioners and partially share philosophical grounds, and despite "a convergence on a set of shared concerns, response to problems, similar practices, and identifiable commonalities among groups" (Howcroft and Wilson 2003a, p. 4), the methods are often described as unique concerning their specific characteristics (Clement and Van den Besselaar 1993; Avison et al. 1999; Spinuzzi 2005a).

While Cole et al. (2005) and others have compared these methods, and they feature prominently in the unresolved debate polarizing 'hard' and 'soft' research approaches (Fitzgerald and Howcroft 1998), this paper takes a different approach. It investigates whether selected IS research projects not only match the characteristics of the research method by which they are categorized, but also whether they share characteristics of the other two methods. This is important, as similar methods, using similar approaches, are rich grounds for cross-fertilization

and knowledge creation can be constrained by splitting ontologically hairs in ways that reduce practitioner relevance or limit IS research productivity. The paper argues that the walled gardens in which methods currently appear to live need to be opened up.

The data set employed here consists of IS research projects carried out in collaboration with practice in a variety of organizational units that have subsequently been published in leading IS research outlets. Text analysis of fifteen IS publications is conducted, each of which focuses on an IS research project undertaken collaboratively between researchers and practitioners. Finally, findings, implications and limitations of the investigation are presented.

2 Collaborative research methods

This section analyses the three approaches, PD and distributed PD, AR and DS with the aim of working towards a comparative synthesis to allow a textual analysis. Each approach is described, along with its research contribution and discussion of its roots and methodological guidelines. The comparative synthesis provides the basis for the text analysis that follows.

2.1 Participatory design and distributed participatory design

PD began by striving for increased democracy in the workplace and worker empowerment, and so challenged the organizational structures of power (Clement and Van den Besselaar 1993; Kuhn and Muller 1993; Asaro 2000). It has now developed to encompass issues such as better acceptance of software, too.

Research contribution. PD regards possible design improvements as objects of study (Clement and Van den Besselaar 1993) and stresses the worker/user perspective during the search for better technology fit in organizations. It permits workers to decide how to implement and integrate technologies in their work practices and aims at system design that integrates workers' tacit knowledge of work processes (Floyd et al. 1989; Spinuzzi 2005a; Spinuzzi 2005b).

Roots. PD developed as an architectural discipline responding to organizational specificities (Kensing et al., 1998a), advocating the difference between theoretical reflection and practical involvement in design (Ehn 1988). Conceptually, PD is based on the Scandinavian practice of computing and process design, on Marxist ideology, and on socialist philosophies (Spinuzzi 2005b). It started in the 1970s in Scandinavia from collaborations between computer specialists and trade unions (Floyd et al. 1989). The exemplary project commonly cited is UTOPIA (from the Swedish standing for 'education, technique and product in a perspective of work quality') launched in 1981 by the Royal Institute of Technology in Stockholm, the University of Aarhus in Denmark, and a typesetting union (Ehn et al. 1983). The large trade-unionist tradition characterizing Scandinavian work relations is often seen as having laid the ground for PD (Asaro 2000). In addition, the legacy of the Tavistock Group in London contributed to the founding

of PD, which later influenced the American movement 'Joint Application Design' (JAD), conceptualized by IBM in the 1980s (Carmel et al. 1993).

PD implicitly integrates the Human Relations School concerned with informal organizational life (Mayo 1933) and the Motivation School dealing with the needs and expectations of people at work (Maslow 1954; Herzberg 1966). Due to those roots, PD is positioned at the intersection of computer sciences, organization studies, and humanities (Floyd et al. 1989). Aiming to resolve rational problems without forgetting their context, Howcroft and Wilson (2003b) link participatory methods to the functionalist paradigm which considers IS design as a contribution to specific needs, and therefore rational.

PD deals with organizational dynamics such as routines, language, and tacit knowledge (Clement and Van den Besselaar 1993; Asaro 2000). It implies learning by doing and results in practice-driven knowledge creation (Carmel et al. 1993; Kuhn and Muller 1993). PD emphasizes permanent learning inspired by the interaction between researchers and workers. It expects additional learning cycles to emerge from these interactions (Argyris and Schön 1978).

Methodological Guidelines. PD instructs researchers to enter the organization under investigation in 'frameworks of cooperation' (Kensing et al. 1998a, p. 173) comprised of researchers, designers, and users (Greenbaum and Kyng 1991; Bødker et al. 1993). It requires involvement of the users in the design activities (Floyd et al. 1989). The degree of participation depends on the participants' goals, aspects of the design, and the overall relevance of the input (Damodaran 1996; Asaro 2000). PD recommends excluding managers in order to involve workers and non-technical staff along the entire system development life cycle (Carmel et al. 1993). Hence, the PD researchers' practical concerns for satisfying both workers' and management's needs require particular attention, due to underlying worker-management conflicts in projects (Howcroft and Wilson 2003a).

According to Kensing et al. (1998a), PD research is based on six principles: (1) 'Participation', i.e., stressing the importance of the users' involvement, (2) 'close link to project management', i.e., suggesting the division of the team of designers and steering committee members, in order to allow each to focus on its respective specializations, (3) 'design as a communication process' (with users), i.e., allowing the tacit components of working conditions and tasks to be included in the design, (4) 'combining ethnography and intervention', i.e., taking into account organizational tacit aspects such as values, (5) 'co-development of IT, work organizations and users qualifications', i.e., focusing on issues behind IT support in organizations, and finally (6) 'sustainability', i.e., demanding certain evidence for long-term usability and acceptance. These principles have been extended, for example, by employing ethnography.

With the application of ethnography, PD research reflects values and tacit elements of the workplace (Blomberg et al. 1993; Kensing et al. 1998a). The idea is to paint a comprehensive image of the workers' environments and thereby serve a better understanding of workers' perceptions of their activities (Kensing et al. 1998a). PD implies numerous iterations, punctuated and initiated by collective evaluations (Carmel et al. 1993). It involves five recurring steps in the research process: (1) Initial exploration, (2) need discovery, (3) ethnographic studies, (4) collaborative prototyping, and (5) evaluation of concrete options (Carmel et al. 1993; Clement and Van den Besselaar 1993; Spinuzzi 2005a).

More recent research in PD has extended the approach to encompass design that takes place in multiple locations. *Distributed PD* recognizes that many contemporary design teams are often not collocated. Naghsh et al. (2006) argue that a limitation of PD is that it primarily focuses on stakeholders being collocated enabling designers to meet face-to-face. However, many software projects involve distributed collaboration and many of the stakeholders have differing levels of expertise and competence (Beynon and Chan 2006). Gumm et al. (2006) identify that many projects are distributed in several ways, involving dispersed developers or distributed users, and that this distribution may be physical, organizational or temporal. Physical distribution involves different locations of people and resources, organizational distribution is related to work structures, while temporal distribution refers to synchronicity of working hours. The authors posit two major challenges in distributed PD: (1) The concepts of real participation and of physical distribution tend to be in conflict—most PD approaches are based on the possibility of face-to-face meetings and (2) PD approaches do not address the organizational distribution within the user group or between different user groups. That software development now has to deal with dimensions such as physical, organizational, and temporal gives rise to challenges especially concerning communication and knowledge sharing and the role of technology to support this (Danielsson et al. 2006; Beynon and Chan 2006). Matz (2006) illustrates some of the problems. These include highly distributed teams having language problems and differing experience in the technical domain language. The teams worked in different time zones which shortened timeframes for on-line conferences, and any face-to-face meetings were time consuming and expensive.

Distributed PD scholars are beginning to suggest solutions to the problems of these dimensions. For example, Gumm et al. (2006) offer five good practices. These involve mediated two-directional feedback to address the organizational and temporal dimensions of distribution, inter-contextual user workshops to reduce distance between users and developers and between different user groups and to bridge organizational and physical distance between users from different domains. Further, they suggest commented case studies to enable an exchange between users of different communities of practice and between users and developers which address the physical and temporal dimensions of distribution and surveys that are used to bridge physical, temporal, and organizational distance. Finally, user support helps to overcome physical distance. Gumm et al. (2006) conclude that organizational distance proves to be the greatest challenge for maintaining a participatory process.

Such good practice developments are the start of a tool kit of solutions to the problems of distribution in PD. Components may come from within the PD community or they may be found in research in similar approaches—such as AR and DS. Indeed, Warr (2006) takes this further arguing that the distinction between situated or distributed design is false as most projects are both. He maintains that design practice in reality occurs across all the cells of the space-time matrix and calls for research to address how to effectively support such a process. This suggests a need for distributed PD not just to look at research on distribution in other approaches but to the approaches themselves. With this in mind, this paper now investigates AR and DS.

2.2 Action research (AR)

AR necessitates action, or, as Lee 2007 puts it, the "raison d'être of AR is, by definition, action" (p. 44). AR is directed towards problem-solving "performed collaboratively in an immediate social situation" (Hult and Lennung 1980, p. 247). Hence, it goes beyond isolated solutions to invoke action and reflection along conceptual frameworks (McKay and Marshall 2001). AR is a change-oriented method that assumes that complex social processes can best be studied by introducing change to these processes and observing its effects (Baskerville 2001). Hence, it focuses on practical problems with theoretical relevance (Clark 1972). The notion of distributed AR (Adamides and Karacapilidis 2006) is established and may involve *research* with *distributed* communities of practice.

Research contribution. AR contributes to both practice and theory (Baskerville 1999; Baskerville and Meyers 2004; Cole et al. 2005). It aims at triggering change and investigates the results of organizational development in a constructed social system (Lewin 1946; Rapoport 1970; Avison et al. 1999; Gummesson 2000; Davison et al. 2004). AR allows researchers to enter the social context under consideration and conduct change in collaborative and mutually nurturing relations with practitioners (Susman and Evered 1978; Avison et al. 1999). It targets practical consequences and is usually organized so that each iteration of an AR process adds to the theory (Vidgen 2002).

Roots. Until World War II, most social science research employed partial and sense data under positivist methods. As scientists started to study behavioral issues during wartime, a call for research methods respecting the socio-psychological aspects of social reality emerged. AR marked an appropriate approach (Foster 1972; Susman and Evered 1978). The roots of AR lie in the works of the Research Center for Group Dynamics in the US on social change and social conflicts (Lewin 1946; 1947; 1948) and of the Tavistock Institute of Human Relation in the UK on socio-technical theory (Emery and Trist 1960), and in Checkland's (1981) view of human activity systems. The Tavistock pioneers believed that research projects should improve work situations that were unsatisfactory in human terms and therefore fostered AR and developed the so-called socio-technical approach (Mumford 2006). Following its genesis in this post-war research, AR established itself as a research method suitable for academic fields as diverse as organization studies and medicine (Baskerville 1999). An early example in the field of IS lies in the Multiview Methodology (Avison and Wood-Harper 1990).

Generally, the action researcher's viewpoint is an interventionist one (Baskerville 1999). Thus, AR differs from positivist epistemological considerations and outcomes due to the implications of the researcher in the field—"prediction versus making things happen" (Susman and Evered 1978, p. 597)—even though AR may develop positivist, critical, and interpretive forms (Klein and Myers 1999). AR follows the main conceptual and epistemological foundations of pragmatism and social constructivism (Baskerville and Myers 2004). Pragmatism understands reality as based on the interactions among social selves (James 1890; Mead 1913; Haack 1976). It demands efforts to understand how people learn and create the structures of their social system (Dewey 1938) and paved the way for later constructivism, which stresses the importance of

practice for developing more context-based knowledge (Bourdieu 1977). Other contributions link AR to post-positivist epistemology (Baskerville and Wood-Harper 1996; Baskerville 1999), which considers knowledge as a contextual artifact, making positivist tools of evaluation obsolete (Susman and Evered 1978).

AR is grounded in the cognitive foundation of learning by acting (Hult and Lennung 1980). It wants to overcome the "juxtaposition of action and research…of practice and theory" (McKay and Marshall 2001, p. 47). Hence, it is closely linked to the double loop-learning concept, stressing iterations in cognitive mechanisms for knowledge creation (Argyris and Schön 1978). The acceptance of participation and reflection by the researcher in the field under study as a research method implies that his/her experience and pre-understanding is a valuable asset to the research (Gummesson 2000), enriched by iterative reflection, from action to concepts and vice versa (Argyris et al. 1985), reflecting Gadamer's (1976) hermeneutic circle.

Methodological Guidelines. AR requires the researcher's participation along the entire change process, stretching from initial reflections on the social context to implementing change in the social system (Davison et al. 2004). AR instructs researchers to determine the requirements for change in dialogue with the actors of the observed social systems. It expects researchers to interpret the inter-subjective meaning of the observations (Baskerville 1999) and to contribute to the organizational change processes and reflect upon the scientific knowledge created in the process.

When conducting AR in IS, it is strongly suggested that the researchers start by stating the "purpose of any action" from a conceptual and practical/contextual perspective (Baskerville and Myers 2004, p. 333) and to follow five principles (Davison et al. 2004): (1) The 'researcher-client agreement' should give clarity to both practitioners and researchers concerning the process and the conditions of work for both parts. (2) 'A model of cyclical process' respects the AR iterative tradition of research steps along a cycle of activities. (3) 'The principle of theory' recalls the importance of conceptualizing the intervention. (4) 'The principle of change through action' puts the focus on change, claiming that any action taken should be an attempt to provide change and therefore should not be hampered. Finally, (5) 'the principle of learning through reflection' assures that the research efforts lead to relevant new insights for other researchers.

As to AR guidelines, Lewin (1947) initially suggested (1) analysis, (2) fact finding, (3) conceptualization, (4) planning, (5) implementation of action, and (6) evaluation. Later refinements have resulted in five iterative steps: (1) Understanding and diagnosis of the situation and its underlying dynamics, (2) action planning, (3) intervention, (4) evaluation, and (5) reflection (Susman and Evered 1978; Hult and Lennung 1980; Baskerville and Wood-Harper 1996; Baskerville and Wood-Harper 1998; McKay and Marshall 2001; Baskerville and Myers 2004; Davison et al. 2004; Järvinen 2005). Concerning the creation of knowledge, AR briefs researchers to ground interpretations in pre-existing knowledge to develop new knowledge following the hermeneutic circle (Gadamer 1976; Gummesson 2000).

2.3 Design science (DS)

DS—also termed Design Research (DR)—is concerned with creating new and innovative artifacts. It constructs and evaluates artifacts of technology to meet organizational needs and to investigate associated theories. That is, it aims at developing theoretically and practically relevant innovative technologies (Walls et al. 1992; March and Smith 1995; Hevner et al. 2004; Cole et al. 2005; Williams et al. 2008; Winter 2008). It "addresses research through the building and evaluation of artifacts designed to meet the identified business need" (Hevner et al. 2004, p. 79-80). DS fosters system development subject to observation and theorizing (Nunamaker et al. 1991). It investigates the creation of artifacts in a specific organizational context and calls for user participation in the project to facilitate a better understanding of the context and thus adequate development, prototyping and evaluation (Simon 1969; Checkland 1981; March and Smith 1995; Orlikowski and Iacono 2001; Hevner et al. 2004). Again, distributed DS has been used for government interactions (Karacapilidis et al. 2005) and in e-business research (D'Aubeterre et al. 2008).

Research contribution. Answering *how to* questions (Walls et al. 1992), DS follows the objective "to create things that serve human purposes" (March and Smith 1995, p. 253). It aims at designing artifacts that enhance the efficiency of the interaction between humans and technology (March and Smith 1995; Orlikowski and Iacono 2001) and, for that purpose, applies design theories to guide developers and reduce their uncertainties in design. DS intends to enhance IT use and performance in organizations, striving for organizational acceptance of its outcomes (Markus et al. 2002).

Roots. The birth of DS as a research field lies in the early efforts of governments and military institutions to apply computing technology in the 1950s and 1960s (Banker and Kauffman 2004). DS is grounded in the seminal work 'Sciences of the Artificial' by Simon (1969) and draws on other disciplines such as engineering, architecture, or art where problem solving through design plays a key role (Hevner et al. 2004). "The intellectual activity that produces material artifacts is no different fundamentally from the one that prescribes remedies for a sick patient or the one that devises a new sales plan for a company or a social welfare policy for a state" (Simon 1969, p. 130).

Differing from natural sciences that are based on positivism and foster insights towards generalization, DS seeks prescriptions. It aims at improving performance through the use of IT in a given institution, in order "to create things that serve human purposes" (March and Smith 1995, p. 253). Hence, DS enables researchers to theorize about the IT artifact itself, instead of building variable-driven theories around the artifact (Orlikowski and Iacono 2001). With its problem-driven orientation, it applies an engineering approach to IT research (Orlikowski and Barley 2001). Being rooted in pragmatism (e.g., Haack 1976), where "truth lies in utility" (Cole et al. 2005, p. 326), DS supports a situated and practice-driven vision of research, where "truth (justified theory) and utility (artifacts that are effective) are two sides of the same coin" and where "scientific research should be evaluated in light of its practical implications" (Hevner et al. 2004, p. 77). Considering the interactions between technology and the members of an

organization as parts of the social construct, DS is linked to the constructivist tradition (Hevner et al. 2004).

DS applies design theory to social reality (March and Smith 1995). It challenges the existing body of knowledge with regard to a kernel theory that underlies the respective IS design theory (Walls et al. 1992; Markus et al. 2002). DS implies understanding of the social construction, its elements, technologies, and organizational members, and their interaction as applied to conceptual and technical development (Iivari 1991). It should be evaluated in light of its practical implications (Hevner et al. 2004). DS builds on double-loop learning schemes that use feedback to trigger further research, which in turn enables additional learning (Argyris and Schön 1978). It considers science as the activity by which theories are not only generated but also tested (Walls et al. 1992).

Methodological Guidelines. Considering the research process as such, DS relies on an iterative IS development process which distinguishes 'build' and 'evaluate' as recurring activities (Keen and Scott Morton 1978; March and Smith 1995; Markus et al. 2002). To better integrate related theory in these iterations, an extended DS process comprises five phases: (1) Identification of needs, (2) grounding in practice, (3) grounding in theory, (4) creation of artifact, and (5) evaluation and theorizing (e.g., Nunamaker et al. 1991; Markus et al. 2002; Hevner et al. 2004; Arnott 2006).

March and Smith (1995) and Hevner et al. (2004) recommend that users participate in the design process in order to understand the context and specific needs, and adequately build and evaluate the artifact with and by users. The integration of user requirements, system features, and principles "deemed effective for guiding the process of development" (Markus et al. 2002, p. 181) is core to successfully conducting DS (Walls et al. 1992). In more detail, Hevner et al. (2004) suggest seven DS principles: (1) 'Design as an artifact', i.e., producing a viable artifact (construct, model, method, instantiation), (2) 'problem relevance', i.e., searching for important solutions for the business world, (3) 'design evaluation', i.e. assuring quality and utility of an artifact, (4) 'research contributions', i.e., reflecting upon the design (how did she/he contribute to the body of knowledge he used?), (5) 'research rigor', i.e., rigorously applying methods along the process, (6) 'design as a search process', i.e. stressing the dual imperative between solutions and environmental constraints, and finally (7) 'communication of the research' underlining the double audience of stakeholders and research community.[1]

2.4 Comparative synthesis

PD, AR, and DS clearly exhibit similarities. However, there is disagreement within and between each of the communities as to how they relate to one another. Järvinen (2007) argues that AR is similar to DS. He compares seven aspects of AR and DS: concrete results, knowledge produced, activities, intent, nature of the study, division of labour, and generation, use and testing of knowledge. He finds the fit between the characteristics of AR and DS to be very high and concludes that AR and DS can be considered as similar research approaches. In contrast, Baskerville (2008), while discussing what DS is not, states that "The community within information systems with an interest in DS research is engaged in a discourse of discovery", (p. 441). How-

ever, he feels DS is not AR. AR is focused on problem solving through social and organizational change. DS is focused on problem solving by creating and positioning an artifact in a natural setting. AR, he argues, is centered on discovery-through-action. In contrast, DS is centered on discovery-through-design. Further, AR is a methodology and DS is a paradigm. Iivari (2007) agrees. He argues that mainstream IS research has lost sight of its DS background but concludes the opposite to Cole et al. (2005) who maintain that DS and AR share important assumptions regarding ontology and epistemology. Iivari states that AR may be used to evaluate artifacts developed in DS and may provide information on how to improve those artifacts. Sein et al. (2007) however disagree with Iivari. They claim that AR is anti-positivistic as it treats each context as unique and that AR and DR, although exhibiting differences, are not incompatible and do not have philosophical stances in conflict. They point to other research such as Järvinen (2007) and Figueiredo and Cunha (2007) who claim that DR and AR are two faces of the same coin. Cole et al. (2005) for example, suggest adding an AR cycle at the end of the DR cycle, enhancing both by borrowing stages and processes or by an integrated approach combining the two.

There seems to be somewhat more agreement about the links between AR and PD. Foth and Axup (2006) compare AR and PD and "would like the larger participatory design community to continue the comparison and exploration we have begun here" (p. 1). They hope to promote the usefulness of AR for PD. They see AR and PD as meta-methodologies or research frameworks as they involve both qualitative and quantitative methods and tools. Both AR and PD entail similar conceptualizations of participatory principles although they are quite different in their intent and purpose. Foth and Axup argue that the key intention of PD is to find ways for people to get involved in research and design activities that may impact on them. They identify various dimensions to participation including pragmatic, theoretical, political for PD and political, epistemological, ecological and spiritual for AR. For them, the imperative of an AR project is not only to understand and report on a given problem but also to provoke change through action and they "think PD and AR frameworks have a similar interest in participation, but different strategies for doing so and with different intent" (p. 4). One route is a dual approach that combines AR and PD frameworks with PD understanding communication and interaction needs from requirements and design prototypes, while AR contributes by ensuring that changes in communication habits, interactions and power is captured by critical reflection, evaluation and informed action. Clemensen et al. (2007) see PD as a research approach for the development of technological solutions to real-world problems. Historically, they claim AR's lack of a concept of technological development led to the development of socio-technical systems design. Yet, socio-technical design was mainly able to influence the organization of work not technological development and it was this lack that was part of the background for the development of PD. Clemensen et al. find that AR and PD both move in interactive cycles but, whereas AR studies tend to focus more on current problems and structures, PD focuses on technological solutions to practical problems. Cahill (2007) describes participatory AR which offers the potential for challenging the normative production of knowledge by including excluded perspectives.

There is little that compares distributed PD with AR. However, Franssila and Pehkonen (2006) use action researchers as intermediaries, "the idea of distributed tasks and roles in design lifecycle for end-users, and for designers from diverse areas of expertise … makes sense but … is rather hard to proceed time-efficiently and without serious interruptions" (p. 4). They claim that

the difficulties of IT designers being both organizationally and geographically distant are partly the result of power asymmetries.

As a contribution to this debate, and as a starting point in assessing whether distributed PD can learn from other approaches, Table 1 summarizes the PD, AR and DS concerning their main (1) research contributions, (2) roots, and (3) methodological guidelines. This similarity demands further attention to assess whether these methods, by existing side-by-side but not interacting, are inhibiting fruitful knowledge exchange.

Research contribution. Despite different outcome foci (social change, artifact design, and technology design), the three methods aim at problem-solving and influencing organizational settings in given practical situations. Referring to change in social systems, AR remains more abstract than DS, which prescribes the creation of an IT artifact and studies the consequences of it. However, the two are similar insofar as "action in action research is itself an artifact" Lee (2007, p. 49). Referring to technology design, PD fills the gap between the other two methods.

Roots. The three methods involve system development as prime theoretical concerns, but either have a focus on social sciences (AR), a combination of social and technically-oriented sciences (PD), or an emphasis on technically-oriented sciences (DS). They commonly refer to the concept of learning in the context of the research project. Although their respective history and 'birth' differ, the Tavistock Institute has influenced both AR and PD. Also, all three share epistemological grounds in the concept of pragmatism.

Methodological Guidelines. The three methods imply participation of organizational members in the research. They instruct researchers to intervene in the organization and collaborate with the practitioner (and sometimes the sponsor) in AR, the user in DS, and the worker—de facto excluding the manager or sponsor—in PD. All three imply subjective elements, challenging the researcher's classic objectified 'observationist' role. Further, they all demand iterative steps in a cyclical process including (1) an initial understanding of the situation (diagnosis in AR, needs identification in DS, initial exploration in PD), (2) researcher intervention in the organization studied, and (3) reflection and evaluation of results before re-initiating the cycle.

This section has developed a comparative synthesis of the three research approaches. The next section describes the research approach which asssesses whether there is common ground that is unexplored that could assist in the development of PD and also distributed PD.

3 Research approach

This research now applies text analysis, a specific type of content analysis concerned with systematic reading of a body of texts, images, and symbolic matters. By analyzing textual data, text analysis helps to retrieve pre-defined structures in texts and allows inferences on the basis of retrieved structures (Krippendorf 2004). Text analysis is a widely applied qualitative method in the social sciences and has been frequently used in the fields of anthropology and cultural

	Method		
	AR	*DS*	*PD*
Research contribution			
Objectives	Change of (social) system, organizational development	IT artifact creation, improved human/ IT interaction, technology acceptance	Technology design, user empowerment to contribute to design
Focus	Practice / Theoretical development	Practice / Theoretical work	Practice / Theoretical consideration
Roots			
Selected core references	Susman and Evered '78; Baskerville and Wood-Harper '98; Avison et al. '99	Walls et al. '92; March and Smith '95; Hevner et al. '04	Greenbaum and Kyng '91, Clement and Van den Besselaar '93, Kensing et al. '98a
Theoretical grounds	Social Sciences	Engineering, Computer Science	Social Science, Computer Science
Learning approach	Learning by acting	Double-loop learning	Learning by doing
Methodological guidelines			
Researcher intervention	On-site in social setting	On-site in organization	On-site at work place
Org. members' involvement	Practitioner contribution to entire research	User contribution to artifact design	Worker contribution to full-development cycle
Determining change/ design requirements	Dialogue	Observation	Ethnography
Research process	Phased, continuous, iterative	Phased, continuous, iterative	Phased, continuous, iterative

Table 1: Method characteristics

studies (Bernard and Ryan 2000), business and management history (O'Connor 1999), organization studies (Prasad and Prasad 2000; Munir and Phillips 2005), organizational behavior (O'Connor 1995; Gibson and Zellmer-Bruhn 2001), and strategic management (Vaara and Tienari 2002; Nørreklit 2003).

In IS research, text analysis has been utilized by Järvenpaa and Ives (1990) who investigated firms' involvement in IT based on letters to shareholders included in business reports, by Scarbrough et al. (2005) who reported on the role of professional media in the diffusion of knowledge management, and by Gallivan and Depledge (2003) who conducted a structured content analysis of 16 published case studies on inter-organizational systems to understand the relation between systems use and trust and control.

Within text analysis, Lacity and Janson (1994) distinguish three approaches—*positivist, linguistic,* and *interpretivist*. The positivist approach, used here, considers texts as objective data representing the reality without interferences. The positivist researcher works primarily on content

analysis, analyzing the text verbatim from a representative sample of textual data by means of categories that she/he has identified from the literature. The researcher uses quantitative measures and validity criteria. The linguistic approach of text analysis considers texts as emergent and influencing a shared definition of reality. It relies on discourse analysis theory (Lacity and Janson 1994) and focuses on the meanings given to concepts and issues by means of interpretation of and confrontation among various points of views. In the linguistic approach, language is more than a representation of reality; it is a part of the shaping of reality. "Through language, people declare couples married, anoint ships, grant academic degrees, and arrest suspects" (Lacity and Janson 1994, p. 145). The interpretivist approach regards texts as subjective data that necessitate the researcher's immersion in the group that produced the content in order to deeply understand the meaning underlying the message. Whereas the interpretivist approach requires an insider's perspective on the data, both the positivist and the linguistic approach consider the researcher as an external analyst, able to interpret by means of structured analytical approaches.

Conducting a positivist text analysis, this research probes 15 selected IS publications (see also Loebbecke et al. 2007). Specific papers are chosen for this analysis from the population that is available. Thus, the publications analyzed here are not a random sample but a purposefully chosen one. Each publication reports on a system or software development project that occurred in collaboration between researchers and practitioners and uses one of the candidate research approaches. Then, the set of papers to be analyzed was chosen based on citation counts with higher counts being preferred. The publications, five per method, were also selected to assure heterogeneity with regard to authors and outlets. Table 2 identifies the author, publication outlet and title of the research categorized by self-reported research approach. All the publication outlets are well established, some appearing high in many journal ranking indices. The publications include MISQ, EJIS, ISJ, JMIS, DESRIST and CACM.

Some care needs to be taken as the terminology in different communities becomes established though the terms may be describing the same phenomena. For example, terms such as 'worker', 'user', and 'practitioner' may all be used to describe a group of people that is affected by, or will use, the software. Indeed, such terms may be used to describe the same person with the same characteristics across different approaches.

From each publication quotes, i.e., sentences or set of words, were extracted which relate to the applied method in the respective IS project (a similar research approach is used in Jarvenpaa and Ives (1990) and Scarbrough et al. (2005)). These were coded and the respective content schemes set against the characteristics of PD, AR, and DS from Table 1. Finally, the text analysis was summarized to assess whether projects conducted under one method also meet the characteristics of the other two methods. Table 3 provides an overview of these findings and the results are described next.

Authors (Year)	*Outlet*	*Title*
	Action research	
Lindgren et al. '04 Salmela et al. '00	MISQ EJIS	Design principles for competence management systems: A synthesis of an action research Information systems planning in a turbulent environment
Vidgen '97	ISJ	Stakeholders, soft systems and technology: Separation and mediation in the analysis of information systems requirements
Braa & Hedberg '02	TIS	The struggle for district-based health information systems in South Africa
Fruhling & De Vreede '06	JMIS	Field experiences with eXtreme programming: Developing an emergency response system
	Design science	
Markus et al. '02	MISQ	A design theory for systems that support emergent knowledge processes
Miller et al. '06	DESRIST*	Using a digital library of images for communications: Comparison of a card-based system to PDA software
Peffers et al. '06	DESRIST*	The design science research process: A model for producing and presenting information systems research
Haynes '06	DESRIST*	Design knowledge as a learning resource
Jones & Gregor '06	DESRIST*	The formulation of an information system design theory for e-learning
	Participatory design	
Kensing et al. '98b	CSCW	Participatory design at a radio station
Anderson & Crocca '93	CACM	Engineering practice and co development of product prototypes
Bødker '96	HCI	Creating conditions for participation: Conflicts and resources in systems development
Clement '94	CACM	Computing at work: Empowering action by 'low-level users'
Grønbæk et al. '93	CACM	CSCW challenges cooperative design in engineering projects

*International Conference on Design Science Research in IS Technology 2006, Claremont, CA

Table 2: Publications included in text analysis

4 Text analysis results

In Table 3, results are presented as follows: two check-marks represent a very strong match where one or more quotes fully support the characteristic of the respective method. One check-

mark indicates that one or more quotes resemble the characteristic of the respective method, and finally, a dash means that there is no match. In evaluating the overall fit of a project with a method (the last column), three check-marks represent a very strong overall fit with more than seven characteristics matching. Two check-marks indicate a strong overall fit with more than five characteristics matching, while one check-mark signals a weaker overall fit with only three characteristics matching.

Publiction		*Research contribution*		*Roots*			*Methodological guidelines*				*Overall fit*
		OBJ	*FOC*	*SCR*	*THG*	*LP*	*RIN*	*OMI*	*CDR*	*RP*	
Action research											
Lindgren et al. '04	AR	√√	√√	√√	√√	√√	√√	√√	√√	√√	**√√√**
	DS	√√	√√	√√	√√	√√	√√	√√	√√	√√	**√√√**
	PD	√	√√	-	√√	√√	√√	√	√	√√	**√**
Salmela et al. '00	AR	√√	√√	√√	-	√√	√√	√√	√√	√√	**√√√**
	DS	√√	√√	-	√√	√√	√√	√√	√√	√√	**√√√**
	PD	√√	√√	√	√√	√√	√√	√√	√	√√	**√√**
Vidgen '97	AR	√√	√√	√√	√√	√√	√√	√√	√√	√√	**√√√**
	DS	√√	√√	-	√√	√√	√√	√√	√√	√√	**√√√**
	PD	√	√√	-	√√	√√	√√	√	√	√√	**√**
Braa & Hedberg '02	AR	√√	√√	√√	√√	√√	√√	√√	√√	√√	**√√√**
	DS	√√	√√	-	√	√√	√√	√√	√√	√√	**√√√**
	PD	√√	√√	√√	√√	√√	√√	√√	√	√√	**√√**
Fruhling & De Vreede '06	AR	√	√√	√√	-	√√	√√	√√	√√	√√	**√√√**
	DS	√√	√√	-	√√	√√	√√	√√	√√	√√	**√√√**
	PD	√	√√	-	√	√√	√√	√√	√√	√√	**√√**

Design science											
Markus et al. '02	AR	-	√√	√	√√	√√	√√	√√	√√	√√	**√√**
	DS	√√	√√	√√	√√	√√	√√	√√	√√	√√	**√√√**
	PD	√√	√√	√	√	√√	√√	√√	-	√√	**√√**
Miller et al. '06	AR	-	√√	-	-	√√	√√	√√	√√	√√	**√√**
	DS	√√	√√	-	√√	√√	√√	√√	√√	√√	**√√√**
	PD	√	√√	-	√	√√	√√	√	√	√√	**√**
Peffers et al. '06	AR	-	√√	-	√√	√√	√√	√√	√√	√√	**√√**
	DS	√√	√√	√√	√√	√√	√√	√√	√√	√√	**√√√**
	PD	√	√√	-	√√	√√	√√	√√	√	√√	**√√**
Haynes '06	AR	√√	√√	-	√	√√	√√	√√	√√	√√	**√√**
	DS	√√	√√	√√	√√	√√	√√	√√	√√	√√	**√√√**
	PD	√	√√	-	√√	√√	√√	√√	√√	√√	**√√**
Jones & Gregor '06	AR	√√	√√	-	√√	√√	√√	√√	√	√√	**√√**
	DS	√√	√√	√√	√√	√√	√√	√√	√√	√√	**√√√**
	PD	√	√√	-	√√	√√	√√	√	-	√√	**√**
Participatory design											
Kensing et al. '98	AR	√√	√√	-	√√	√√	√√	√√	√√	√√	**√√√**
	DS	√√	√√	√	√√	√√	√√	√√	√√	√	**√√**
	PD	√√	√√	√√	√√	√√	√√	√√	√√	√√	**√√√**
Anderson & Crocca '93	AR	-	√√	-	-	√√	√√	√√	√√	√√	**√√**
	DS	√√	√√	√	√√	√√	√√	√√	√√	√√	**√√√**
	PD	√√	√√	√√	√√	√√	√√	√√	√√	√√	**√√√**
Bødker '96	AR	√√	√√	-	-	√√	√√	√√	√√	√√	**√√**
	DS	√√	√√	-	√√	√√	√√	√√	√√	√√	**√√√**
	PD	√√	√√	√√	√√	√√	√√	√√	√√	√√	**√√√**
Clement '94	AR	√√	√√	-	√√	√√	√√	√√	√√	√√	**√√√**
	DS	√√	√√	√	√	√√	√√	√√	√√	√√	**√√√**
	PD	√√	√√	√√	√√	√√	√√	√√	√√	√√	**√√√**
Grønbæk et al. '93	AR	√	√√	-	-	√√	√√	√√	√√	√√	**√√**
	DS	√√	√√	-	√√	√√	√√	√√	√√	√√	**√√√**
	PD	√√	√√	√√	√√	√√	√√	√√	√√	√√	**√√√**

OBJ – Objectives	RIN – Researcher intervention
FOC – Focus	OMI – Org. members' involvement
CR – Selected core references	CDR – Change/Design requirements
THG – Theoretical grounds	RP – Research process
LP – Learning approach	

Table 3: Matching fifteen IS projects to characteristics of three methods

When analyzing the fifteen projects from the selected publications on the level of method characteristics (see Table 1), 26 (of 45) combinations of project and method show a strong fit, indicating a very strong match for most individual characteristics. Fifteen strong fit combinations result from each publication following 'its own' method. The additional eleven strong fits (out of 15 papers) between project and method indicate a match of a project with one of the other two methods on the majority of individual characteristics.

Most AR projects show a strong similarity with DS characteristics; and some AR projects also reflect PD characteristics. DS projects present some similarity with the other two methods. Finally, PD projects indicate an almost perfect resemblance with DS characteristics and a very strong similarity with AR characteristics (Tables 3, 4, and 5).

	AR project characteristics			*DS project characteristics*			*PD project characteristics*		
	AR	*DS*	*PD*	*AR*	*DS*	*PD*	*AR*	*DS*	*PD*
Objectives	√√	√√	√	√	√√	√	√√	√√	√√
Focus	√√	√√	√√	√√	√√	√√	√√	√√	√√
Selected core references	√√	---	√	---	√√	---	---	---	√√
Theoretical grounds	√√	√√	√√	---	√√	√√	√√	√√	√√
Learning approach	√√	√√	√√	√√	√√	√√	√√	√√	√√
Researcher intervention	√√	√√	√√	√√	√√	√√	√√	√√	√√
Org. members' involvement	√√	√√	√	√√	√√	√	√√	√√	√√
Determining change/ Design requirements	√√	√√	√	√√	√√	√	√√	√√	√√
Research process	√√	√√	√√	√√	√√	√√	√√	√√	√√

Table 4: Summary of projects meeting method characteristics

Four characteristics, 'research focus', 'learning approach', 'researcher intervention', and 'research process' show a perfect match; at least 44 of the 45 selected projects show evidence of

all three methods. Five other characteristics show strong evidence. 'Organizational member involvement' has 41 very strong matches. Also, 'determining change/design requirements', 'theoretical grounds', and 'research objective', have 36, 33 and 32 of 45 possible very strong matches respectively, illustrating a good fit. Only 'selected core references', with 16 of 45 matches, does not offer much evidence for projects also meeting the characteristic of the other two methods (Table 5).

	AR project characteristics			*DS project characteristics*			*PD project characteristics*		
	AR	*DS*	*PD*	*AR*	*DS*	*PD*	*AR*	*DS*	*PD*
Objectives	√√	Δ Organizational improvement vs. artifact design							√√
Focus	√√	√√	√√	√√	√√	√√	√√	√√	√√
Selected core references	√√	Δ Slightly different core references							√√
Theoretical grounds	√√	Δ Computer science vs. social science							√√
Learning approach	√√	√√	√√	√√	√√	√√	√√	√√	√√
Researcher intervention	√√	√√	√√	√√	√√	√√	√√	√√	√√
Org. members' involvement	√√	Δ Managers' vs. workers' involvement in PD							√√
Determining change/ Design requirements	√√	√√	Δ Ethnography only in PD					√√	√√
Research process	√√	√√	√√	√√	√√	√√	√√	√√	√√

Table 5: Summary of method characteristics across projects

PD Publications. All five PD publications show that the respective projects also meet AR characteristics. For instance, Bødker (1996, p. 220) aims at "general processes of organizational development". Kensing et al. (1998b, p. 244) "discuss coordination in a complex organization with multiple, different and reconfigurable groups". Supporting a learning-by-acting approach typical for AR, Anderson and Crocca (1993, p. 50) apply "[o]pen and continuous feedback", and Bødker (1996, p. 226) points to "a structured brainstorming activity meant to emphasize critique, fantasy, and realization in three phases". Concerning users' involvement, Anderson and Crocca (1993, p. 50) argue that "[t]he team recognized the need to involve the users from the beginning in all planning and development activities". Clement (1994, p. 57-58) finds that "[m]anagement…released the clerical staff to participate in project activities" involving the organizational members on an ongoing basis, where "the study circles were an impetus…generally reshaping the design process as a whole so it was more in tune with the organizational realities" (1994, p. 58). Kensing et al. (1998b, p. 248) report that the "analytic activities conducted by the design team involved approximately one third of the total 140 employees". By using inter-

views and workshops, Grønbaek et al. (1993) worked to foster an AR-typical dialogue including observations, interviews, workshop, prototyping, and evaluation "in which users were actively involved" (p. 69).

Finally, PD projects also meet DS characteristics. Bødker's (1996) project "deals with user participation in the design of computer applications" (p. 216). Her objective of designing an IT artifact is clearly articulated; the "purpose of the project was to design a number of computer applications" (p. 219). Clement's (1994, p. 58) objective is 'the specification of an IS'. Kensing et al. (1998b, p. 244) "use the term "design" in the same way as architects do – focusing on the analysis of needs and opportunities". They explicitly appreciate that the "employees gave valuable feedback" (p. 253) to the design effort. As in DS, the authors focus on the actual design and the typical DS learning cycle. Grønbaek et al. (1993, p. 67) cover the interaction between technology and individuals, a classic DS domain. Their long-term project is centered around approximately 10 developers and 20 users. Concerning the learning approach and research process, Clement (1994, p. 58) claims that "the study circles were an impetus in structuring (and restructuring) the design team, overcoming an impasse". Anderson and Crocca (1993, p. 50) wanted the research process "to support an iterative, evolutionary development, delivery, and evaluation process", hence clearly seeking one that also meets DS characteristics.

AR Publications. The five AR publications offer numerous quotes in support of DS characteristics. Lindgren et al. (2004, p. 443), for instance, illustrate a typical DS objective to "identify design principles for CMS" and also show substantial support for double-loop-learning by indicating "a second action research cycle" (2004, p. 446). Vidgen's (1997, p. 27) project is "concerned with the development of software for wind tunnel operation". Braa and Hedberg (2002, p. 119) report on practitioner contribution to artifact design in a "period of active prototyping and user interaction". Salmela et al. (2000, p. 7) stress the user contribution in the IS projects they studied over a longer period of time: "Data collection continued via personal visits to the research sites, telephone interviews, and conversations. The last contacts with the client organizations concluded seven to nine years after the initial project proposals". Regarding the research process and the change/design requirements, Fruhling and De Vreede (2006, p. 48) state that "[a]fter the release of three key prototypes at different points in time, full-system usability evaluation was done". Vidgen (1997, p. 30) claims that his research process "consists of the following activities: current situation analysis, systemic stakeholder analysis, requirements capture and future analysis"—linking it closely to DS processes.

IS projects covered in AR publications show evidence of meeting PD characteristics. Salmela et al. (2000, p. 8), when aiming at "a new control information system (CIS)" experienced that "the difficulties in improving the CIS reflected a more general political tension". Vidgen (1997, p. 39) states that "[n]ew ways of working supported by new technologies were explored in the future analysis allowing us to envisage different and exciting scenarios" signaling a will to ameliorate workers' daily tasks typical of a PD learning approach. Similarly, Salmela et al. (2000, p. 8) point to a learning approach that resembles the PD one and claim that "[t]he analyses made during different planning stages were extensive". Lindgren et al. (2004, p. 444) stress the users' involvement when describing how they "collected information about users' experiences with various kinds of IT-based competence management solutions…The data collected through

the technology review and the workshops were discussed and analyzed in collaborative sessions involving both action researchers and practitioners". Fruhling and De Vreede (2006, p. 48) also stress user involvement; "[a]ll team members, developers and users, contributed to the online workspace". Braa and Hedberg (2002) refer to core references of the PD literature such as Ehn and Kyng (1987), and Greenbaum and Kyng (1991), and report on a research process typical of PD: "This is the start of the period of active prototyping and user interaction, which continues at the time of writing" (Braa and Hedberg 2002, p. 119).

DS Publications. In the DS publications, we find a number of distinctive quotes serving as evidence for also meeting AR characteristics. Markus et al. (2002, p. 191) follow the "objective of improving overall organizational effectiveness", resembling the typical organizational AR objective. Haynes (2006, p. 333) states that "the Rampart anti-terrorism planning system is the product of a three-year collaboration between the United States Marine Corps and a research team from academia." In the project reported on by Miller et al. (2006, p. 457), "feedback from the user study can be incorporated into the next iterative development cycle" pointing to a typical AR learning approach. In their respective DS studies, Peffers et al. (2006, p. 99) select "30 participants from different end-users segments to participate in the study" to show organizational member participation, and Markus et al. (2002, p. 188) pursued a dialogue through "interviews with representatives from the four sponsoring companies" and "over an 18-month period, the development team repeatedly intervened into the organizational design activities of the involved companies". The closeness to AR is also obvious when Markus et al. (2002, p. 187-188) state that "the TOP Modeler project followed this action research strategy ... deploying prototypes that tested various assumptions about how organizational work is done, observing how users responded and iterating". There is reference to the AR research process in Jones and Gregor (2006, p. 357), who describe "[a]n iterative action research process [that] has been used to evolve the system and the associated ISDT through three distinct generations over the last ten years".

DS publications also show evidence of PD characteristics. For example, Markus et al. (2002, p. 189) reflect that "there might be resistance to using the system by both potential hands-on users and managers" and that they "learned that the IS design theory…was inapplicable to the organization design process. As a result we were forced to reconceptualize" (p. 188), pointing to learning efforts during project conduct. Miller et al. (2006, p. 457-458) find that "it is imperative that we temper our desire to improve the software with the need to maintain consistency for our users". Markus et al. (2002, p. 191) quote typical PD work by Greenbaum and Kyng (1991) in the context of claiming that "the Domain Team's responsibility was to represent potential users and review prototypes in an iterative development methodology…using user-centered techniques such as joint design meetings and cooperative prototyping." Concerning the research process applied, Peffers et al. (2006, p. 94) stress the planning along stages similar to classic PD conduct: "The development of the DSRP model included six steps". Haynes (2006, p. 333) stress that "the project team carried out requirements elicitation, prototype design reviews, focus groups, and structured walk-throughs with over 200 people from the Marines", pointing to both the research process and the user involvement typical of PD.

Overall, the IS projects covered in the fifteen publications not only meet the characteristics of 'their' method, but to a large extent also meet the characteristics of the other two methods and thus are potential, but unexploited, knowledge sources (Figure 1).

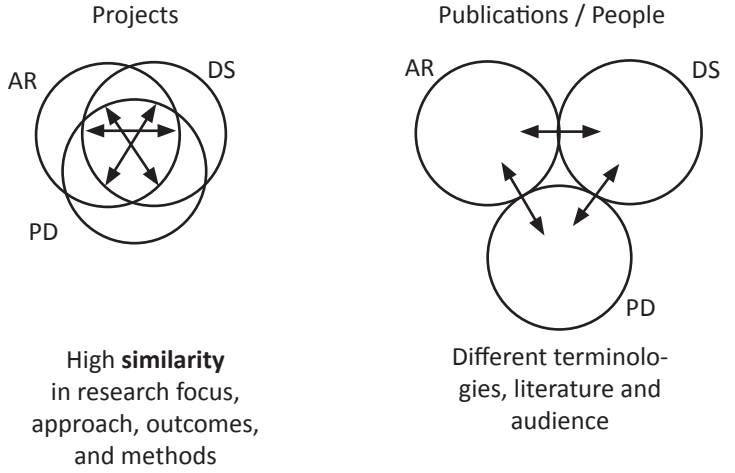

Figure 1: Summary of observed phenomenon

5 Discussion and conclusions

The analysis contrasts the commonalities of IS research contributions published under PD, AR, and DS in terms of research focus, outcomes, and research process, with their differences of terminology, references, and audiences (Figure 1). The notion of distribution is gaining ground in all three of these domains, but there is, as yet, an insufficient numbers of publications in each focussing on distribution to allow such an analysis to be performed solely investigating the issue of distribution. This analysis, however, lays the groundwork for such research.

In common with Fitzgerald and Howcroft (1998), who recognize the strengths within different, seemingly competing research traditions, this paper can hold the tension between innovating at the edge and building robust research streams. Similarly, Baskerville and Pries-Heje (2001) show that multiple-theory analysis of technology diffusion leads to different but complementary insights; Fitzgerald (2003, p. 227) appreciate "the idea of competing and alternative research methods in IS" and Avison (2003, p. 229) suggest that people use different methods "to address different aspects" of the complex relations between technology and organizations. Hence, the observed phenomenon may be interpreted as sign of increasing diversity and specialization in the IS field, reflecting "IS as a fragmented adhocracy" (Banville and Landry 1989). Or, following Simon (1969) who stresses the fertility of multiple points of view for a young discipline, the phenomenon may be seen as having successfully developed separate research sub-communities

in spite of limited differentiation. Such separate sub-communities, also labelled communities of research (Boehme 1975), scientific communities or intellectual communities (Mulkay 1979), consist of the practitioners of a scientific specialty (Banville and Landry 1989).

Perhaps PD, AR and DS are better viewed as paradigms rather than methods; a "paradigm... serves to define what should be studied, what questions should be asked, and what rules should be followed in interpreting the answers obtained. The paradigm is the broadest unit of consensus within a science and serves to differentiate one scientific community (or sub-community) from another" (Ritzer 1975, p. 7). If so viewed, then this paper points to the underlying similarities exhibited in PD, AR and DS and prompts those researching the development of distributed PD to look to AR and DS as fruitful areas of inspiration and comparison. For example, the discussion of distributed AR (Adamides and Karacapilidis 2006), that involves *AR* with *distributed* communities of practice may prove useful or distributed DS used for government interactions (Karacapilidis et al. 2005) or e-business (D'Aubeterre et al. 2008). Information systems research has been criticized for its lack of impact upon practice. This research suggests that there is a lack of cross-fertilization from approach to approach, and that walled gardens exist or are starting to emerge. Thus, there is a need for the walled gardens of different methods to at least have windows so that knowledge can be exchanged and ultimately the walls need to be removed. However, as demonstrated by this research, the walls are high at present and, though there is some evidence of cracks in the windows, distributed PD may miss potential sources of enrichment. It may be that some approaches actively seek out external ideas while others are more insular, or that there is a time dynamic which involves communities building the garden walls as they develop their approach. Walled gardens may allow research communities to flourish away from the gaze of the current dominant paradigms and the development of new, specialized research outlets can be beneficial, but set against this is the lack of evidence that some such specialization is special at all and that redundancy fuelled by a lack of participation from other communities may obtain.

The research reported here is, however, bounded in several ways. First, the sample of papers is small, though no claim is made here for statistical significance. Rather the paper surfaces and explores phenomena. However, the quality of the publication outlets suggests that these papers have been through a rigorous peer review process and the reviewers must have accepted that the reported research approach was appropriately described. In addition, the sample size of quotes limits the persuasive power of the findings, even though replication is straight-forward based on the selected fifteen publications and the method characteristics in Table 1. To substantiate the findings, future research could extend the sample. Second, using publications as a unit of analysis only considers the 'finished product' and not the process by which it emerged. Authors may be aware of other literatures when they write but do not choose to reference them, or the editing and publication process may result in the exclusion of references to some types of literature. Next, in most instances, following a linguistic approach to the text analysis in addition to the positivist one, and interpreting the IS projects in the context of the complete publication text, would have enriched the picture. This could provide further support for, or confound, the overall finding. Third, one could have also looked at the actual research methods as unit of analysis, instead of investigating the projects covered in papers published 'under a method'. For instance, Cole et al. (2005) investigate differences and similarities between methods and reveal

that AR and DS are remarkably similar and "share important assumptions regarding ontology, epistemology, and, more importantly, axiology" (p. 332). If one avoids the idiosyncrasy of the methods and stresses their similarities, an investigation into whether projects fit under more than one method becomes almost tautological—without easing the underlying issue. Finally, the research analyzed here may reflect different research scope and intentions though this does not mean that the output could not be reported under a different label or that cross-fertilization of ideas is precluded.

6 Notes

1. A slightly different set of iterative steps is provided by Dunne and Martin (2006) who refer to testing artifacts in context, inducting generalizations, abducting ideas, deducting consequences, and retesting the ameliorated artifact.

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