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From Practice to Design and Back: Emergence of an Information Service View

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Abstract

A critical part of transforming research to practice is the recognition of the coordination between the research domain and the problem-solving domain. An action research perspective which supports this coordination is useful in the realization of a new ***information service view*** *of technology. The information service view engenders a shift from the provision of defined and preset services or applications to an environment that enables users to actively select and integrate technology services in the ongoing creation and re-creation of unique information systems in the service of action. In this research, we argue that design practice in the construction and evaluation of the information services view is a necessary complement to the expansion of research to construct a coherent view of this emergent class of IS. We use an exploratory case analysis of practice to construct a unique information service view and suggest that this view of service-oriented information systems can benefit practice and research.*

Keywords

Information Service View, Service Oriented Architecture, Design, Development, Action research

INTRODUCTION

An *information service view* (ISV) is a unique meta-category of information technologies (Orlikowski and Iacono, 2001). An ISV is constructed from the observable emergence of a new class of information environments that are mutable, reflective, and loosely coupled. These new information service systems are based around the concept that users, provided with smaller function components, are capable of assembling unique, ad hoc information systems that suit their own contexts, tasks, use patterns, and metaphors (Germonprez et. al 2007). Service oriented architectures and Web 2.0 technologies have dramatically increased the pace at which these technologies are emerging and it is critical for practice and research to inform one another in the pursuit of understanding and designing these technologies. Design Science research has traditionally viewed information systems through a develop/build and generate/test framework (Hevner, et.al 2004) and thus guided the types of systems in place within organizations from a positivist perspective. But the emergence of mutable, tailorable, service-oriented technologies has increasingly allowed user interaction in the ongoing creation and recreation of information systems. A new generation of users, unconstrained by classical IS design methods, is creating unique, personal service configurations, blogging and tagging ideas, discovering, enriching and mashing-up information, and integrating knowledge. Maps services are a typical example where users access online maps and add information (photos, locations, routes, data from other services) and distribute the new map as a service itself.

As with many technical information systems advances, research on service-oriented information systems has examined individual factors and technical specifications that provide insight into a single, practical perspective of complex socio-technical systems. This research approach is representative of the "product view of design" (McKay and Marshall 2007) in which problem solving has come to dominate design science research. This approach is epitomized by Hevner et al. (2004:109) who state that the goal of design science research is "the development and evaluation of technologies."

The emphasis on technical factors in the design of socio-technical systems has come under criticism for neglecting the philosophical foundations of design research (McKay and Marshall 2007; Niehaves 2007). In response, recent research has included development of design science theory focused on Heideggerian

environments (Germonprez et al. 2007) and interpretive epistemology in design theorizing (Neihaves 2007). This new perspective is well articulated by McKay and Marshall (2005:6) who state:

> *"Design researchers are not merely designing an artefact to solve or ameliorate a problem: They are also charged with conducting research into some aspect or dimension of the design activity relevant to a particular problem-solving space."*

In this research we contend that knowledge is currently dominated by flows from practice to research with quite limited transformation of knowledge from research to practice. Our field study of organizations which are developing and implementing information service technologies and architectures demonstrates that the practice community is involved in many technical and conceptual problems that have only recently, if at all, come to the attention of the research community. Despite the numerous studies that deal with the development and technical aspects of service-oriented systems and architectures, there has been little effort to research "the interlocking systems that manifest, support, constrain and envelop" (McKay and Marshall 2005:2) such information service systems. In this paper, we examine how the pragmatic, deployment-level issues of the information service view frequently inspire research. Subsequently, after lengthy research, writing, reviewing and publication processes, the research outcomes may be transformed back into practice. These two processes and the transfer of knowledge between them, is well articulated through the lens of action research By viewing our data as an emergent form of action research we show how the development of a meta-category view of service-oriented IS will benefit the transformation of research into practice, a transformation that, at the moment, is unproductively slow.

The speed at which these services are being developed is outpacing our academic timetable. To address this deficiency, this research begins to construct a coherent *information service view* incorporating related technologies, organizational goals and strategies, user behaviours and use patterns, and a philosophical shift in design theorizing. In examining the transfer of knowledge from practice to research and back, action research provides a meta-framing methodology (Mumford 2006; Chiasson et.al forthcoming) to involve practitioners and researchers in creating a coherent information services view to better understand, design and implement this new class of information system. Use of the action research perspective allows us to observe that, although the practice domain is addressing a broad view of the technology encompassing multiple areas of concern and interconnected concepts, there is no comparable view of service orientation in the research domain. As a result, the technology perspective is often at odds with the philosophical perspective on what the technology could provide, how it is used, or how it should be designed. We argue that it is critical to recognize that the two perspectives are not mutually exclusive but instead represent complementary ends of the spectrum in the overall creation of a knowledge base regarding service-oriented information systems. It is through the incorporation of both the research and practice cycles that an information service view can be achieved.

To understand the circular path from practice to research and back, it is useful to examine the knowledge transfer that occurs between the phases of action research (Figure 1). To accomplish, we have to consider philosophical design principles that define the research space of an ISV as well as technical and problem-solving issues related to service-oriented architectures and implementations. By themselves, each of these perspectives provides a poor representation of an ISV. We must recognize how to transform the research concepts into practice while simultaneously examining practice and the behaviours of users to inform and refine research.

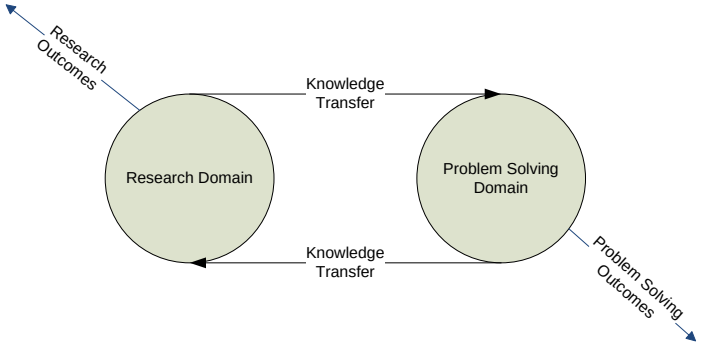

Figure 1: Knowledge Transfer between Action Research Phases (Chiasson et al., forthcoming)

This paper speaks directly to the areas of concern (A) and the real world problem settings (P) (Checkland 1991; McKay and Marshall 2001) evident inside organizations implementing ISV related technologies. Action research has long been used as a framing mechanism to address the research/practice interaction but the number of researchers taking this approach remains low (Chiasson et al. forthcoming). We contend that an ISV cannot be a 'research first' approach in which research is transformed into practice. Rather practice and research are

complementary domains of knowledge creation which contribute to overlapping knowledge bases. To this end the construction of the information services view will provide a coherent framework to guide both domains. In this research we highlight the practice domain to identify the scope and breadth of areas of concern and problem settings that construct and differentiate an ISV from other meta-categories of IS (Orlikowski and Iacono, 2001).

THE INFORMATION SERVICE VIEW

The information service view is a perspective that defines a new problem space for the creation of information environments that are mutable, loosely coupled, and emergent. An ISV specifies that system users are function-oriented actors who envision desired goals and identify meaning and value through the action of creating and configuring recombinant information services. An ISV suggests that designers of services do not need to know how their services are going to be used, but instead should develop a reflective environment where users' thinking, goal identification, and the identification of meaning is supported. This view represents a shift in design from the provision of a fixed, designer-controlled service set, to design of "a space of potential for human concern and action" (Winograd and Flores 1986: 37). Prior research has generally conceived of services as enterprise legacy-system and application integration (Lee et. al 2003), providing information (e.g. weather), or affecting the world through specific (e.g., ecommerce) service (Fensel and Busler 2002). In an ISV, services are defined by the function they fulfil for the user, not through prescriptive ways the designer intended they be used. An ISV shifts the focus of services to action and recreation of meaning by the user thereby allowing new services and functions to emerge. Intrinsic to an ISV is the idea that "the users and the designers do not, in fact, share the same model of the task domain" (Dourish 2001: 131) and that services "will often be used in ways that were nor anticipated in their design" (Winograd and Flores 1986: 53). From an information services view the user, rather than the designer, makes decisions about the relationships among services, types and relevancy of data and outputs, and what things functionally go together as representations of the real world (Hovorka 2005).

An ISV represents a meta-category view of service-oriented, socio-technical information systems which include technologies and architectures, use patterns, emergent recombinant systems and user/artefact interactions. Earlier conceptualizations of meta-category views of information technologies include the tools view, proxy view, ensemble view, computational view, and nominal view (Orlikowski and Iacono 2001). These meta-categories serve to cluster differing concerns and foci researchers and practitioners have regarding information technology artefacts and their contexts of use. As such they provide a comprehensive conceptualization of information systems which “challenge us to engage more seriously and more explicitly with the material and the information technology artefacts” (Orlikowski and Iocono 2001:130). By recognizing a meta-category of service-oriented information systems that are emerging in practice, we can begin to “theorize about the meanings, capabilities, and uses of IT artefacts, their multiple, emergent, and dynamic properties, as well as the recursive transformations occurring in the various social worlds in which they are embedded” (Orlikowski and Iacono 2001:133). In addition, we are able to serve both research and practice, speaking to the respective research and practice cycles, the knowledge transfer between the two, and their associated outcomes. We address this differentiation in more detail following our field study regarding the ISV.

THE INFORMATION SERVICES VIEW FRAMED THROUGH ACTION RESEARCH

Action research (AR) is meta-framing methodology that is comprised of both a research and practice cycle. Our field study is not an example of action research; rather, we adopt the action research framework to argue for the necessary connections between research and practice. Our study explores four organizations that have adopted and implemented information service-oriented systems. This dual perspective provides a balanced view of how research and practice are necessary in the creation and clear articulation of an ISV. Action research acknowledges the importance of both the research and the practice cycles and that together they help researchers develop a rich understanding of a particular phenomenon. The balance between the practice and research cycles can take on a variety of different forms, whether research dominant or practice dominant (Chiasson et al., forthcoming).

One of the problems that AR research faces is that it is often interpreted as a turn-taking mechanism. First practitioners do their work, then researchers, then partitioners, and so on. McKay and Marshall (2001) suggested otherwise, that it is in fact a model where researchers and practitioners work in unison. We adhere to this philosophy and suggest that the practice-cycle findings in this paper demonstrate the value in observing practice to clarify and define research agendas. We are reporting research areas of concern and problem settings facing real organizations (practice) with respect to an ISV. Research is informing practice through working with the organizations to articulate their views, see their current states of use, and identify their opportunities. Practice is informing research by providing an agenda of research needs within organizations, issues that need immediate attention and provide identifiable areas where researchers can perform projects which can inform our academic community. These activities operate in parallel, sometimes indistinguishable from one another. In this paper, we are building the understanding of what constitutes an ISV and we are doing so with a slightly stronger focus on the problem-solving domain (Germonprez and Mathiassen 2003).

The action research concepts identified in this paper are not intended to be a comprehensive account of all concepts across practice and research. Rather, we have identified a cross section of concepts that practitioners are addressing to demonstrate opportunities for research to delve into areas currently under development. During this research we found than practitioners are better equipped at speaking to the relationships between each of the concepts that within an ISV and understanding how they interconnect. The research side lacks a coherent view that is necessary for understanding artefacts; the emerging dynamic properties of the artefacts in use; the users' competencies, attitudes or behaviours; or the social/organization transformations that are occurring due to their use. Therefore, we are initially focusing on the problem-solving phase to determine how practitioners conceptualize service-oriented information systems.

The frame of action research splits the practice domain into areas of concern (A) and real world problem settings (P). Prior action research framing papers have identified these two issues as critical in the practice phase of an action research agenda (Checkland 1991; McKay and Marshall, 2001). Prior work (Avgerou 2000; Chiasson et al., forthcoming) has distinguished five areas of concern for Information Systems research:

1) Organizational application of IT
2) The process of systems development
3) IS management
4) The organizational value of IS
5) The societal impact of IS

These thematic areas represent the broadening of information systems research under a traditional design model that an information system is designed, implemented, and used in a predetermined manner, with a set of predetermined outcomes. In contrast, the ISV encompasses a new and emergent class of information systems which are designed, implemented, and used differently than traditional information systems and raise unique concerns for the information service oriented practitioner and researcher. With that, we entered the field to determine what the primary areas of concern are with respect to the class of information services oriented systems.

To do that, we set out to identify the real world problem settings facing organizational use of an ISV. The real world problem setting is the immediate concern of people in real situations. These represent the at-hand, applied, and day-to-day issues that face people designing, implementing, or using service-oriented technologies. The real world problems represent the issues that comprise the areas of concern. In the case of Avgerou, five areas were identified from the wealth of data surrounding published IS literature. Our approach is slightly different, in that we are building an ISV area of concern from the field-identified, real world problems and using these areas of concern to differentiate the ISV from prior meta-category conceptualizations of IS.

We suggest that a coherent information service view, one that relies on both research and practice, will provide a framework and coherent language and terminology for research into the areas currently being developed in practice. An ISV will therefore enable researchers and practitioners to design, discuss, and develop ISV-related systems and technologies within the same comprehensive and consistent framework. In the next sections, we present our field study in the identification of real world problem settings (P) with respect to an ISV. We then categorize our P's into broader areas of concern with respect to an ISV.

THE INFORMATION SERVICE VIEW IN PRACTICE: FINDINGS

In conducting the field research, we focused on three major stakeholder categories: managerial, developer, and users. Each of these groups have different roles in the design, development, and implementation of service-related technologies and each have different ideas regarding the definitions, functions, and goals of IS "services."

In all organizations, service orientation was initially viewed as a set of technical specifications that comprises standards on how such technologies are designed, developed, and deployed at a programmatic level. The principles of services are not unique to today's computing, but with the rapid diffusion of Internet-based technologies, it has become a feasible way of developing systems, specifically in heterogeneous, distributed, and web-based computing environments. These technologies support the selection, application, and modification of programmatic functions to be assembled into a larger system. The XML-based packaging system associated with these technologies has proven to be highly beneficial in abstracting the programmatic details of a service down to a universally readable interface. Changes to a service at the programmatic level do not affect its interface, thereby enabling system developers to choose services based on abstract interfaces and not specific languages. Three researchers worked with three companies and a large national scientific research organization (all based in the United States) to ascertain the areas of concern in adopting and implementing service-oriented technologies. The companies included a Fortune 500 insurance organization involved in redeveloping traditional systems into serviced-based systems; a consulting company that is using information services for software distribution for a multi-national company, an international trucking company that is using a service orientation for internal

systems design, and a national scientific research facility and data repository moving to an information services orientation for information discovery and access. These data were collected over three years of field work, totalling more than 50 interactions across the companies. The 50 interactions consisted of over 30 preliminary interactions (informal meetings, telephone conversations, and emails). While these interactions were informal, field notes were collected and analysed in the formation of more formal interview questions. In all, 20 formal interviews were conducted across the companies with executives, managers, systems developers, and systems users by the three researchers. Interviews (structured and unstructured), observations, and field notes were the primary sources of information. The data were textually analysed and coded by the authors in the identification of event listings and recurring ISV-related themes (Miles and Huberman 1994).

We have chosen to not stratify the data across the three groups of managers, designers, and users. We had difficulty with the data knowing where individuals acted as users and where they acted as designers or managers. The recombinant nature of an ISV suggests that in an event in which one provider develops a service, their subsequent action may be to consume another service in the fulfilment of their own needs. Individuals can rapidly shift from provider to manager to user in the process of interaction. Service-oriented systems are not managed in the sense of traditional information systems but instead can be created in an ad hoc, as needed basis. To categorize one person as a manager or as a designer and nothing else, often artificially subdivides the ISV. Our goals are to identify why organizations are subscribing to the concept of information services, what are their problem settings in this domain, and what the key areas of concern are.

The groups inside the organizations that dealt with an ISV were generally more technically inclined. An ISV is just beginning to emerge at an organizational level and has not fully diffused to every employee. In the sense of Roger's adoption curve, an ISV is still at the innovator stage. What we did see was that the development groups involved in service-oriented technologies were now beginning to realize its potential. From this realization, service technologies are now beginning to emerge organizationally as they can apply to real business problems.

Motivations

The first issues we set out to understand were what motivated the groups within the organizations to adopt a service orientation. As service technologies are computationally complex and sometimes counterintuitive with traditional information systems, we sought to know why development groups were drawn to develop and implement the technologies. A summary, in no particular order, is presented below:

- Thin client access to legacy systems
- Bandwagon effect
- Organizational innovation
- Maturation of service-oriented technologies
- Technology reuse
- Design and use flexibility
- Dynamic capability
- Creation of adaptive, open, and dynamic systems
- Promotion and realization of service view of an organization
- Perceived need for cross-functional information sharing

Taken individually, these motivations do not promote a new view of information systems and indeed, these could be provided as motivations for any new IS technology, not just service-oriented ones. But collectively these begin to outline the difference between the ISV and prior conceptualizations of IS identified by Orlikowski and Iacono (2001). There is a desire to break away from the siloed and inflexible information systems that limit organizational capabilities and develop a model of discrete, reusable, and recombinant services that can be assembled in new, innovative ways, which can promote information sharing, and offer simpler access to all systems in a heterogeneous environment.

Given these motivations, the next step was to identify the key issues that the development and material groups within the organizations dealt with when as they transitioned to a service orientation. These real world problem settings provide a more explicit picture of the particular challenges and views of service orientations, policies, and technologies that will help construct the ISV.

Real World Problem Settings

The real world problem settings (P's) represent two things in our study. First, they represent a part of the problem-solving domain that is used to inform and be informed by research. The P's represent a fundamental piece of a practice/research relationship that we have argued is necessary to develop and understand an ISV. Second, the P's represent the building blocks for the areas of concern that comprise another critical element in understanding the problem-solving domain.

In our research, we identified the applied issues presented to practitioners when designing, thinking about, or using service-oriented technologies. The discovery of P's was an emergent process that became more coherent as the field study got longer and the data began to coalesce around recurring problems. The major issue was to identify what the recurring P's were and not simply the temporary, idiosyncratic problems that developed due to the trial and error nature of implementing services. That is, as services themselves are often emergent based on the selection of different suites of technologies sometimes, P's dealt with 'how to modify a programming language to support XML messaging' or 'whether to use remote procedure calls versus document calls' which are short-term issues that do not represent longer term real world problems that are applicable across organizations. Table 1 represents a summary of broadly applicable, real world problem settings that were deduced from our interviews, observations, and notes.

Table 1: Summary of ISV-related Real World Problem Settings

Real World Problem Settings
Application Distribution: Provide access to services across organizational boundaries such that applications in one organizational division can use services from another.
Application Updates: Updates include changes to data types and service locations.
Application Tailoring: Enable users to see the information they want to see and change the view based on changing contexts
Centralized Business Logic: Control the business logic layer in a heterogeneous environment.
Data Transport: Managing how data logic layer connects to various databases
Data management: Creation of meta-data, commensurability of data, archiving of served data, data accuracy and validity
Foster Innovation: Encourage users to combine and use services in the creation of new information systems
Information provisioning: services provide a new, flexible way for external users to access archives and data
Interfaces and Standards: interconnection of services across heterogeneous computing environments requires adoption of common standards and interfaces
Loose Coupling: Remove tight binding between programmatic modules
Need for cross functional information service discovery and sharing: Provide mechanisms for discovering services and documentation on how to connect services across the spectrum of stakeholders
Proxy Classing: Create new business logic that can analyse an incoming request for a service and act as a proxy in regulating access to or from a service.
Scheduling: Scheduled triggers to apply application updates.
Share Business Logic: Decouple information systems so that business layer logic can be shared between organizational units
Support the Unknown: Provide information to customers in unknown environments through unknown devices.

The real world problem settings show us a broad set of characteristics that practitioners are dealing with on a daily basis with respect to an ISV. These P's further draw attention to the differences between the ISV and previous meta-categories. Specifically the emphasis on innovation, loose coupling, and recombinant reuse of component services by users, and support of unknown tasks and contexts highlights the emergent and interaction- based nature of the ISV. The ISV explicitly recognizes that designers and service providers can not articulate coupling of the system to the world by defining what it is intended to do and what the consequences of use will be. Rather users will create new structural couplings in alignment with their domain of action (Winograd and Flores 1986). From these real world problem settings we can extract the areas of concern which represent a broad set of categories that help define an ISV.

Areas of Concern

The areas of concern associated with an ISV differ from aforementioned Avgerou's proposed categorizations largely due to the nature of the real world problem settings. The ISV envisions ad hoc, undefined uses where

designers cannot always know what the use or functional outcome factor for the systems is going to be. For example, a motivation titled 'organizational innovation' is not typically what you think of when you think information systems. Practitioners see service-oriented technologies as an opportunity to encourage employees to seek new ways of combining information and services in the creation of value-adding systems that would have never been developed if not for a service orientation. With this, the determination to capture all variance in systems design is not feasible; to consider a design model successful if all factors and outcome measures can "be rigorously demonstrated" (Hevner et al. 2004: 83) is meaningless. We argue that with the requirements for design within the ISV we will perforce temper our desire to over-specify systems. Instead, we have to design systems for broader, unpredictable contexts, and we must measure different research outcomes that do not relate to unexplained variance in order to produce more interactionist systems.

This is counter to Avgerou's heavy emphasis on specified outcomes such as "value" and "impact." The areas of concern that we propose address the underlying problem settings and a recognition that pragmatic issues remain as pitfalls in the formation of an information service view. In keeping with our framework, the areas of concern are where rigorous and timely research could help resolve current issues in practice. They represent tractable issues that organizations have articulated and are working on in order to realize an ISV.

To begin the identification of areas of concern, we asked the interviewees what they considered to be key areas that need to be resolved for "successful" implementation of information services. From these comments, we used the identified P's from Table 1 to identify our areas of concern. Table 2 illustrates the areas of concern identified from the data.

Table 2: Areas of Concern

Key Areas of Concern	Description	Supportive Real World Problem Settings
Distribution and Discovery of Services	How services are built, managed, and discovered; how services are recombined	Proxy Classing Loose Coupling Application Distribution Scheduling Shared Business Logic Information Service Discovery/Sharing Application updates Information provisioning
Governance of Services	How services are guaranteed, how services transcend business units/who pays for services; access control to services, internally and externally	Data Management Interfaces and Standards Centralized Business Logic Shared Business Logic
Management of Services	Creation and provision of metadata; archiving of data. Commensurability and accuracy of data.	Centralized Business Logic Interfaces and Standards Data Management
Innovation and Tailoring of Services	User defined and structured information systems assembled from provided services for relevant domain of action	Application Tailoring Foster System Innovation Support Unknown System Use Information Service Discovery/Sharing

The areas of concern represent issues relevant at the organizational, group, or individual levels. For example, the discovery of services has bearing at the organizational level regarding the development of an organizational service repository. It has bearing at the group level as teams determine what services they want to develop and provide. Finally, it has relevance at the individual level through people performing day-to-day activities that involve the identification and use of new services. These areas are pragmatic and require focused research and resources to develop solutions to address these areas. The tenor of the interviews was that these were a list of 'to do' problems along the path of realizing a cohesive ISV of service-oriented information systems. From our field work we saw that people are adept at considering service-related issues across various business areas of concern. For example, they are able to consider how service management interacts with the service governance. This is not to say that they have the solutions on how to most effectively manage the relationship, it is at minimum a clear understanding that the areas of concern are interconnected.

The identification of real world problem settings and the subsequent categorization into areas of concern show that practitioners have moved away from the traditional areas of concern defined by Avgerou (2000). In our research, we have found that areas of concern with respect to an ISV focus on the expansive and undefined future and evolution of this class of information systems. Organizations that adopt service technologies must consider how the services are built, governed, secured, and used in unknown, often distributed environments. This runs counter to traditional information systems that often have a known user base, a known environment, and known measures of performance. The areas of concern and real world problem settings reveal that the class of service-related information technologies presents a new conceptualization that invites research focus and theorizing. We confirm the view that the technology should not be "black boxed" or "vanished from view" (Orlikowski and Iacono 2001: 122) but rather clearly articulated and researched.

DISCUSSION

The information service view is the realization of user-enabled, real-time production of ad hoc information systems supported by technical development. Understanding the trajectory for a service oriented system incorporates a mix of technical development, managerial goals, and emergent user behaviours to tailor services in the context of use. An ISV recognises that there is a fundamental shift in the view of technology, from an external artefact (product view of design) to an interactionist perspective in which the user is a primary participant in the creation and recreation of context dependant information systems. A specific assemblage of socio-technical components is created through multiple groups working with the same technology in the achievement of different goals Orlikowski and Iacono 2001). By analogy, examining the case of the World Wide Web, there were developers working with the nuances of the technology (IPv4, HTML, JavaScript, Web Servers) concurrently with frontline users who were identifying new ways of using the emerging environment without concentrating on the technology (Amazon.com, Akamai.com, Ebay.com,Yahoo.com). It was when these two views of the same domain formed a unified, functional view that the new potentials of the Web began to emerge.

What we have illuminated is half of the picture that contributes to the ISV. The other half comes from the research and publications in the research cycle. We suggest that, prior to transformation of research into practice, research must observe practice in the process of describing the phenomena. Examples of such research includes the design of technologies which support innovation (Germonprez et al. 2007, Winograd and Flores 1986), frameworks and perspectives for design (Gregor and Jones 2007, Niehaves 2007), and structural alternatives for supporting service discovery and data management (Dourish 2001). Although these are initial steps in researching this emerging class of IS, this research provides foundational concepts that can be transformed back into the practice.

With respect to developing an integrated view of an ISV, the transformation between practice and research requires that the areas of concern be addressed by the research community and the knowledge base be transferred back to practice so trial and error design iterations can be minimised. As the service orientation is becoming better supported by technologies, it is incumbent on designers, managers, and users to consolidate a stronger, more holistic view of what services are, how they can be applied, and how users interact with them. The information service view suggests we need to consider it as a new design philosophy based on interaction and "possibilities for action," novel applications, and emergent properties in addition to its products and technical capabilities.

The development of an ISV for the class of information service oriented systems is not complete. In the case of the Web, we continually discover and implement new technologies, create new meanings, and new ways of configuring the two into an information "life world" of competencies, attitudes, and behaviours. As we develop an information service view, we must include a richer user view that identifies not just primary designers but includes frontline users that are working with the technology. We must also understand other broad sets of technology and the impact that they can have on service-oriented architecture. These include but are not limited to nomadic computing, ubiquitous computing environments, and Web 2.0.

An action research lens helps the research and practice community visualize the intertwined activities that are required for practice to initiate research, which in turn, can be transformed into practice. We see that developers and managers are still struggling to find a common view of the technology, processes, and areas of concerns with regard to services. Continued development of an ISV will allow the different views of services, their implementation, management, and technologies to become more coherent and aligned. As this occurs, the potential for action of the technology can be realized.

Figure 2 illustrates the relationship between the research and problem-solving domains. The concepts and terminology used in practice are not always the same as that used in research and vice versa. Figure 2 expands the AR perspective by showing examples of the outcomes and framing issues of each domain. These are not intended to be comprehensive lists; rather they illustrate the emerging holistic view of an ISV.

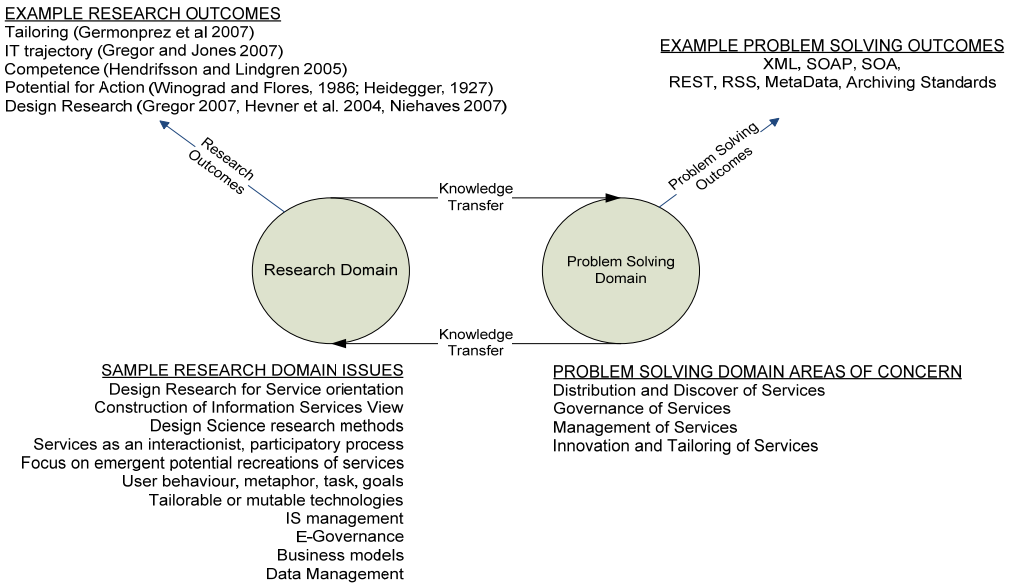

Figure 2: Holistic View of an ISV

In using the action research frame to identify real world problem settings and areas of concern, our findings identify the *information service view* as a new, emergent meta-category of information technology artefact not identified by Orlikowski and Iacono (2001). The information service view supports an environment that distinguishes between the initial *design* and the *ways of doing design* and requires that attention be paid to the different experiences, perceptions, intentions, and goals that the user will use to recombine services and redesign the system. An ISV emphasizes a phenomenological *potential for action* in which the user continually tailors information services to create meaning and develops uses in new contexts or for new tasks (Germonprez et al. 2007). An ISV moves away from a predominant approach in systems design to over-engineer the IT artefact through a restricted set of data structures, interfaces, and reporting systems, so that work practices are constrained.

In particular, the area of concern: *Innovation and Tailoring of Services* defines the ISV as a meta-category distinct from prior conceptualizations (Orlikowski and Iacono, 2001). The 'ensemble view' of technology is similar to an ISV but does not realize it. The ensemble view focuses on how concrete technical IT artefacts come to be developed or come to be used and implies that complete and final systems are the result of an ensemble of social and technical realizations. The ensemble view then suggests that these systems can be realized and structured to fit the unique needs of an organization. The innovation and tailoring of services suggests that we first consider the design, exposure, and discovery of services while only later considering the context in which a service may be used. The ISV suggests that we no longer model the characteristics of an information system a priori, nor do we model any system that may emerge from an ISV. Instead we model the relationships and interactions of services. For research to be transformed into practice, we must first observe how unique, ad hoc information systems are being assembled in relationship to users' contexts, tasks, use patterns, and metaphors. As services will be used in ways not anticipated in their design, design research must begin to create information environments where users participate according to their life-world of competencies, attitudes, and use practices. An information services view will provide research and practice with more holistic and coherent pictures of the socio-technical-phenomenological assemblage that is emerging and allow better integration of practice and research activities. As designers, we remain value-free and let the user environment and context dictate the coupling of system services to the world and which services go together. The characteristics of an ISV suggest we no longer model, simulate, and optimise this class of systems; rather we support innovation, adaptive use, and the "potential for action". We do not seek to capture systems and determine causal outcomes, rather we seek to filter and identify the relationships between services. We do not design IT artefacts, we disseminate access to actions.

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