PARTY E-SERVICE: ELUCIDATING, REDEFINING, AND EXTENDING E-SERVICES

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ABSTRACT—The term e-Service has often been used, but the term has never been elucidated and especially in an e-Business setting. In this paper we discuss the evolution of e-Service and propose a conceptualization of e-Service. We conceptualize existing e-Services as: First-party e-Service – where software is delivered through electronic means for a particular client and Second-party e-Service – where software is delivered through electronic means for multiple individual clients. We also extend existing e-Service by introducing Third-party e-Service - where software is delivered through electronic means for numerous clients with interaction and value co-creation in mind. We utilize design science research as our methodology to develop e-Service design principles, as they can lead to innovative solutions and theoretical contribution. Design science research has the benefit that it can raise research rigor and generalizability. The design principles can form as the reference point for system designers and implementers to embark on.

Keywords—e-Service; design science; design theory; collaboration; architecture

1. INTRODUCTION

E-Service has been much discussed in the literature [8][13] and often e-Service is considered as a mere service provided through an electronic medium. We agree with this meaning, but we advocate that a clearer delineation and description of e-Service for B2B can further advance research in this area.

The e-Service evolution can be traced back to the beginning of where service is rendered per user per site as a physical entity, with the exact intent of serving a single client – 'software in a box'. As the Internet was opened to the business community in late 80's, numerous software and applications were provided in a web environment as a service to serve multiple clients with multiple instances of the same software/application. Companies welcome such IS practices to gain a reduction in acquisition costs for IT infrastructure and its maintenance.

The current e-Services have the characteristics that they have one or many instances to serve a

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single client. We advocate that there is a need for e-Services to serve multiple clients, following the view of service-dominant logic (S-D logic). SD-logic's philosophy is to 'co-create value' rather than taking the traditional 'embedded-value' of goods dominant logic for granted [28]. The current e-Services are not equipped for value co-creation as they are designed for singular clients. For instance, it is common practice for a logistics service provider, or a forwarder, to coordinate among shippers, warehouse operators, truckers, and carriers to complete a shipping request. Such 'coordination service' clearly includes on-demand interaction between multiple clients and cannot be enabled by current e-Services.

A new kind of e-Service is needed to facilitate the continuous development of e-business. The emerging needs to the e-Service require an essential shift from serving individual clients to multiple interacting clients, with provision for value co-creation [31]. Moreover, the concept of a third-party view of the service provider with neutrality and other characteristics must be developed and articulated. However, the design of the e-Service is neither trivial nor straightforward. For instance, the prevalent service-oriented architecture (SOA) does not describe how clients can form partners and interact. If such a service serves multiple parties, the formation of these parties is a shared functionality, which fundamentally, is to be and not yet facilitated by the current architecture.

In this paper, we design an e-Service artifact following abductive design science research (DSR) approach. We first propose a foundational concept of party e-Service. With the characterization of party e-Service, we establish meta-requirements to guide the meta-design. We define a set of design principles for first-party and second-party e-Services as common practices, grounded on existing literature, and propose a new set of design principles for third-party e-Services. We follow up with a discussion on the architectural consideration, based on the design principles. Finally, we validate the design by instantiating a logistics shipment planning e-Service platform. This paper ends with discussions and suggestions for future research.

2. RESEARCH BACKGROUND

2.1 The Emergence of e-Service

The world is clearly transforming from one that was good-based toward service-based or a service world. Services were once viewed as a kind of goods apart from agricultural and manufactured goods. Under S-D Logic, services are defined as applications of knowledge and skill for the benefit of a party [28]. Goods on the other hand, are distribution mechanisms for service provision. S-D Logic is a mindset and emphasizes on the nature of social economic exchanges. Service science is a related, emerging area of study, and focuses on understanding the nature of service system entities or in short entities [11][23]. Entities which create and consume services are complex configurations of resources including people, organizations, shared information and technology. Information technology (IT) plays a significant role in service science as IT not only enables codification of knowledge but also facilitates service design and delivery [4].

IT-enabled service was first realized by codified structured human knowledge into computer program or application. Initially, application creator/programmer and user often belong to the

same organization, due to geographic location, time zone and language constraints. Indirect exchange masks the fundamental service for service basis of exchange. Software is often found in standalone office computers for a single user [7]. Common business applications are often exchanged as products.

As the Internet made great strides in the 90's, business software were able to serve multiple individual users by migrating to the web environment [17]. The advent of web technologies enables application developers to effectively construct IT-enabled services for clients across the globe. Companies as a result attend to reduce acquisition costs for IT infrastructure, accessing office and business software via outsourcing or obtaining services through ASP over a network [11][30]. More importantly, it suggests a new conceptualization of IT-enabled service, namely Software-as-a-Service (SaaS).

SaaS related efforts aim to improve service offering and delivery. To further enhance interactions between service systems, a software application can take advantage of SOA by revealing its functionality to other service systems via public brokers [5]. Each software application can act as a service requestor; through the public broker it can find and bind useful software for service [19]. Many researchers are keen to look into business implications of these IT-enabled services and have found encouraging results particularly on improving inter-organizational relationships [10].

Despite the fact that the service world is still rapidly evolving, one consensus has been reached, that it calls for value co-creation which requires joint or direct participation of both provider and consumer of the service [30]. The current SOA is designed for one service system (provider) and interacts with only one service system (requestor) at a time. A service that requires direct interaction of more than one provider and one requestor for value co-creation is currently not supported.

2.2 Design Science as Research Methodology

The IS/IT discipline mostly deals with IT artifacts and the human interaction with these IT artifacts. Most of the research in IS/IT are of behavioral nature and aims to develop and verify theories that explain human or organizational behavior. The design and development of the IT artifact, on the other hand, is less established. Design science research (DSR) is recently introduced to address this aspect and aims to build and evaluate artifacts that extend human or organizational capabilities [27]. The forte of DSR lies in that it introduces research relevance and rigor to IT artifact designs equivalent to natural science [15]. Typical DSR studies deal with a class of problem that occurs frequently, in contrast to many consultancy projects – research relevance. DSR studies typically put much effort in validating the design, often by instantiation, mathematical proof, etc. – research rigor.

Au observes that many existing e-commerce systems overlook the key aspects of design principles, and argues that DSR should play an important role in e-commerce research [3]. Walls et al. describe the nature of design theories [29]. This seminal work provides a theoretical grounding for good design and what the thinking process should entail. Design theories, as they argue, are prescriptive and composite theories, and deal with contingent goals. Hevner et al. provide a conceptual framework and clear guidelines for understanding, executing and evaluating a DSR [15]. Recent advancement in DSR has successfully brought the results of construction of

artifacts into highly respected IS academic journals. Design science artifacts such as an interaction-centric model for user-artifact relationship [2] and a design framework for text-analysis of computer-mediated communication [1] are examples of well-cited publications.

Most of the current DSR studies are data-driven, inductive reasoning, where general knowledge is developed from observational data by inductive inference [14][22]. The benefit of inductive reasoning is that the IT artifact is often already in use and the validity of the IT artifact can be easily proven. However, inductive DSR studies seldom contribute to the kernel theories, as they are context specific and are often thin on existing body of knowledge. This is also the reason why research in DSR has not reached a critical mass yet. Abductive discovery, on the other hand, is theory driven and creates innovative problem solutions. These types of DSR studies are rare and have the advantage that they are context independent and theory driven – can contribute to the kernel theory. Our study is of the latter type, an abductive discovery.

3. PARTY E-SERVICE CONCEPTUALIZATION

A service, in general, is considered to be either "the work performed by one that serves" or a result as a "contribution to the welfare of others"[1]. E-Service, similarly, involves a service provider and served client(s), while it is distinctive in being delivered via electronic means. In this study we delineate e-Service in that the provider and the client could appear as information systems or computing machines, and the service could be accomplished by software applications.

Based on the aforementioned evolution of e-Service and interpretation of e-Service we define party e-Service as follow:

3.1 First-Party e-Service

Service provider develops an e-Service for the same organization; we call this 1st party e-Service. This e-Service is commonly found, as individual client(s) access the e-Service through a corporate intranet to accomplish particular business needs, e.g. queue management – wait ticket number. There are two fundamental methods 1st party e-Service: 'self-help' and 'do-it-for-me' (Figure 1).

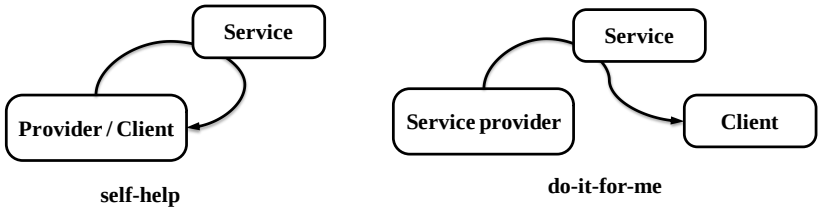

Figure 1. 1st party e-Service

The former is a self-help service, where the provider develops the service for his own use. This in-house development is common. As to the do-it-for-me method, a service is outsourced and owned

[1] Source: Merriam-Webster Inc., Merriam-Webster Online, www.m-w.com/dictionary/service

by a client, and is developed by a designated provider, e.g. a trucking company's fleet management module. IT outsourcing is, for instance, a type of do-it-for-me service [24]. In both cases, the interactions between a service and its client(s) can be pre-determined and well defined, since the information provider and the receiver are given.

The delivery of this e-Service is typically packaged and then installed on the client's site. Therefore, high transparency is a main feature, in other words, finding and accessing the services are immaterial. The disadvantages would be the high cost for developing and maintaining such e-Service as it is for designated clients only. The 1st party e-Service is being challenged as the Internet comes into play, which provides effective connections to many potential clients.

3.2 Second-Party e-Service

The intent of the 2nd party e-Service is to serve not a designated client(s), but any client(s). These e-Services can be identified with numerous business software packages now available on the market, e.g. inventory management, or the QuickOffice App. The pervasive use of the Internet, ushered more providers to offer such services, affording a larger pool of service alternatives for clients to choose from.

From the e-Service provider's perspective, a 2nd party e-Service must be configured to be discoverable and delivered via electronic mediums (e.g. the Internet), see Figure 2. The need for service discovery and service delivery has been identified and considerably studied. Through a service discovery mechanism, clients can access a large pool of e-Services and find the service required and then be served. A service provider's e-Service gains a wide exposure automatically to potential clients, and high reuse of the service module.

2nd party e-Services are taking full advantages of e-commerce. Loosely, the discovery process is often satisfied by search engines on the Web. Once a service provider is located, the client can obtain the service. When there are more services available, the client will have to evaluate them before linking with the chosen service. It is clear that two clients using the same e-Service from the same provider at the same time are not aware of each other. Interaction between the two individual clients (or with others) is usually only possible through other services, e.g. instant messaging and offline communication.

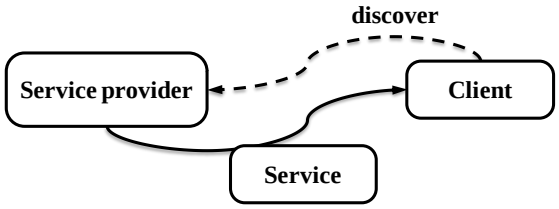

Figure 2. 2nd party e-Service

3.3 Third-Party e-Service – A New Kind of e-Service

When an e-Service involves the participation of more than one client together, the provider must ensure the service facilitates collaborations among clients. These e-Services are necessary, as they can support the emerging need of value co-creation, where clients need to collaborate to provide services. An example will be provided in a later section. This new kind of e-Service is called 3rd party e-Service.

A 3rd party e-Service provider must be interaction-oriented rather than only individual-need-oriented (Figure 3). The provider acts in a neutral capacity, is indifference to the interest of any client(s), enables ad hoc interactions among clients to complete the service. These clients can be unacquainted, yet amendable to collaboration in the e-Service. The interactions among clients are denoted by a two-direction dashed bold line. The 3rd party e-Service is known to interacting clients by discovery or by default. Ultimately, 3rd party e-Service helps clients to work with each other, solve problems or conduct transactions with joint capability and know-how.

Real life business processes or transactions commonly require the involvement of multiple interacting participants. e-Service should target not only the needs of independent operations or processes but the needs of cooperation or collaboration among participants. The conceptualization of 3rd party e-Services shows an essential shift from serving the needs of individual clients to the needs of interacting clients.

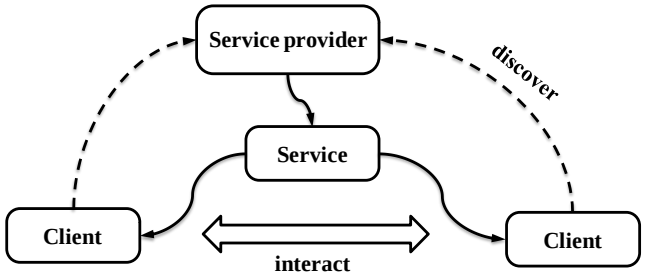

Figure 3. 3rd party e-Service

4. PARTY E-SERVICE CONCEPTUAL DESIGN

We conceptualize e-Services from the perspective of the roles of the parties involved. The provider and client of 1st party e-Service are usually of a same party. In other cases, a 1st party service can be provided by a different party but known to the client. 2nd party e-Service is provided by a self-governed provider who can be discovered by its potential clients. As a 3rd party e-Service serves the interaction of multiple clients, it should be neutral as a third party. The characteristics of these party e-Services are shown in Table I.

Next we propose design principles based on our inductive epistemological conceptualization of n-party e-Service. The design principles should be seen as a steppingstone for system designers and developers to embark on and fuel the e-Service discussions for academia. Based on the existing literature we abstract design principles for 1st party and 2nd party e-Services. We also propose

design principles for 3rd party e-Service based on our conceptualization in the context of e-business.

TABLE I. CHARACTERISTICS OF PARTY E-SERVICES

	1st party e-Service	2nd party e-Service	3rd party e-Service
Nature of provider	Self-owned	For hire	For hire with neutrality
Service Targets	Individual client	Multiple individual clients	Multiple interacting clients
Service availability	By default	By discovery	By default or discovery
Client relationship	Singular	Singular	Partnership
Client interaction	Not considered	Not considered	Required

4.1 Design Principles for First-Party e-Service

Principle #1.1: Design for separating software possession and ownership from its use. The clean separation of software possession from the use of the software [25] is fundamental for e-Service, along with applications development focusing on the specific functionalities of the software is delivered as intended [6].

4.2 Design Principles for Second-Party e-Service

Principle #2.1: Design for serving a client(s) with no personalized affinity. Service-oriented applications are designed with no affinity to any particular service consumer [21]. Here the service consumer is dependent on the service, yet they are loosely coupled.

Principle #2.2: Design for service identity exposure for public announcement. The service identity is important to announce a service in an electronic environment, such as the Internet [12]. The purpose of the service should be specified. It should also support dynamic discovery or automated discovery on a machine level. To enable the identity exposure of an e-Service, the service may leverage a brokerage mechanism.

Principle #2.3: Design for defined use of service anywhere. The service should define a programmatic access 'contract' which helps a client to understand how to access and use the service. Since the client may operate with different systems in different environments, a universal/standard interface and protocol is needed for the automated use of the service [7][9][16].

4.3 Design Principles for Third-Party e-Service

Principle #3.1: Design for service with multiple clients. A service with a functionality, which necessitates the collaboration of multiple clients, that once achieved, benefits all participating clients as each intended to gain.

Principle #3.2: Design with partnering facilitation of matching clients. To complete an e-business process, multiple clients must participate and contribute together. A client finds an interested 3rd party e-Service only as one of the collaborating partners, with the necessity to 'locate' other fitting partners to accomplish the e-Service. The service provider facilitates a systematic way to partner with potential clients.

Principle #3.3: Design for interaction among clients with neutrality of service. To come to a successful outcome, the 3rd party e-Service clients need to interact and co-create the value for the collaborated service. The enablement of interaction needs to consider, the message structure - making the information ready, date security – revealing data to intended clients only, transformation pattern - supporting broadcasting of specific information to all clients, and interaction timing – Transferring and receiving specific information at desired instants.

5. THIRD-PARTY E-SERVICE ARCHITECTURAL MODEL

SOA is the leading architectural framework for e-Service implementations (Figure 4). As such, the design principles for 1st and 2nd party e-Services can be met with SOA. In the architecture a service provider publishes its service in a service registry, while a service broker manages requests from a service requestor. The architecture effectively makes a service discoverable and available to pervasive individual clients. It also successfully enables loosely coupling service and enhances the effectiveness of service reuse.

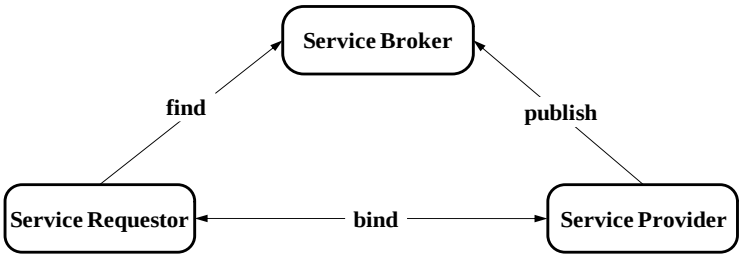

Figure 4. Service-oriented architecture

Here we propose a new architecture, 3rd Party Service-Oriented Architecture or 3P-SOA (Figure 5), following the proposed principles for 3rd party e-Service. The architecture consists of the original SOA's service broker, service provider, and service requestor (client). In here, they are viewed as service system entities. A new proposed entity is the partner broker.

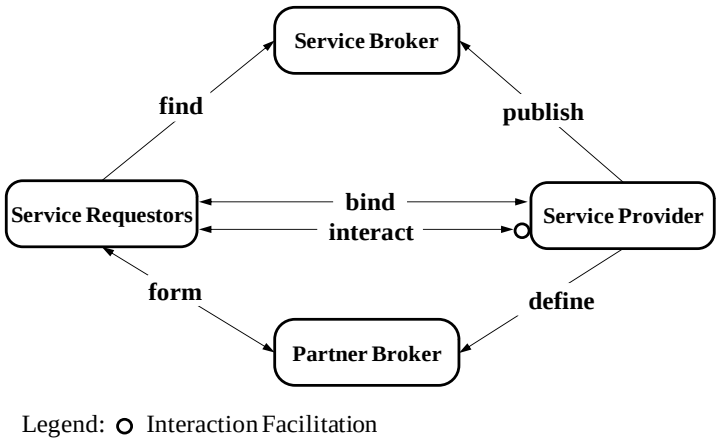

Figure 5. 3rd party service-oriented architecture

'Service provider', usually is the owner of the e-Service, develops and manages the service, and releases specifics in a description document, or a contract to the service broker, then awaits discovery by clients. The function of the service provider is extended to facilitate interactions of partners in the service. A client acquires particular e-Services in its interest via a service broker. 'Service broker' is a matching agent that maintains a service registry. A client requiring a 3rd party e-Service discovers such services as the service broker locates matching service specifics in the registry on behalf of the service providers. 'Partner broker' facilitates partner discovery and partnership formation. The broker keeps a tabulation of clients for 3rd party e-Services as multiple clients can be involved in the service, or 'form' partners with respect to the service if such details are available in the service description. In general, the establishment of a partnership involves three tasks: selecting partners, establishing relationship and developing agreement [20][26]. It should be noted that the partner configuration with respect to a 3rd party e-Service is subject to the interaction involved in the service.

'Interaction' is the essence of a 3rd party e-Service. The interaction is facilitated by the service provider, not a facility provided, to highlight the neutrality of the service. The description specifics can be found in a contract, which typically contains participants of interactions, behavior patterns of participants, identifications and associations of interacting participants, patterns of information exchanges in interactions, and business process deducing from interactions.

With the same virtue of SOA, a 3rd party service must be described to enable clients to discover and match their needs. In addition to 'publishing' the service in a service broker for service discovery, a service provider should 'define' the partnership requirement in a partner broker. A client can first 'find' a desired 3rd party e-Service via service broker, then retrieve the description document about the service, and for instance, know which partner broker is designated to facilitate the partnership formation. The client will subsequently contact the partner broker entity and 'form' partnership with other client(s) with the help of the partner broker. When the partnership formation process is successfully completed, each of the collaborating clients 'bind' and the corresponding e-Service will be invoked. Interactions among clients, in any combination, throughout the service are facilitated by the 3rd party e-Service according to the binding communication capability of each client.

In sum, the 3P-SOA requires new description specifics, a new partner broker entity, and new operations. New contract-like description specifics 'define' the party aspects of the new architecture. Without an effective contract, clients can neither get to know how to access and utilize the multiple party service, nor the right partnership can be 'formed' as required by the service.

6. DESIGN THEORY INSTANTIATION & EVALUATION

Characteristics of e-business processes often point to the need of an escrow 3rd party e-Service to enhance the e-business realization. In a prior research we described the need for an integrated shipment consolidation service [18]. At that time no e-Service was readily available and we use our proposed third party e-Service to solve our aforementioned shipment consolidation problem. The case setting is described below:

6.1 An Industry Case – Collaborative Shipment Planning

A shipment's logistics process usually consists of many inter-related activities, such as trucking, sea transporting, aviating and warehousing, and involves multiple parties, such as forwarders, sea carriers, air carriers, and warehouse operators. Typically a logistic service provider arranges the delivery of a number of shipments concurrently with the available transport resources. To design a shipment plan, a forwarder needs to estimate costs, identify feasible integrations and consolidations, and optimize the assignments of shipments to logistic service providers. This currently is mainly done manually or by using proprietary disconnected 1st party e-Services.

In our case a client needs to ship cargo from Hong Kong (HKG) to Las Angeles (LAX) via Taipei (TPE). Such a route is typically covered by sea transport from HKG to TPE and air transport from TPE to LAX. This shipment can be fulfilled by many parties. However, a collaborative planning between the potential participants can greatly reduce the cost and improve the efficiency. For instance, the client offers its shipment needs to many logistic service providers in order to lower its cost. Sea and air transporters can offer services according to their capacity utilization, e.g. charge lower when a planned transport still has adequate capacity left – analogous to last minute air tickets. Such a collaborative effort can lead to a win-win situation for all stakeholders.

In order to solve our aforementioned problem we developed an artifact (a prototype[2]) that allows the clients to collaborate through interaction according to our proposed design principles and 3P-SOA architecture.

For this artifact we had to develop description document and a service/partner broker.

Description document – We first referenced WSDL, as it describes the connecting characteristics of a service to a single client. We also investigated in WS-BPEL and WS-CDL as they can describe the service delivery context. However, these description languages were not designed for multiple clients. We therefore propose a 3rd Party e-Service Description Language (3P-ESDL) and extend the existing description languages with descriptors such as *role*, *identification*, and

[2] http://blueberry.ccl.baf.cuhk.edu.hk/3PSOA/ShipmentPlanning

association. Moreover, 3P-ESDL defines business processes from a third party perspective rather than an orchestrator; we therefore propose descriptors such as *businessContext*, the properties and participants involved, and *activity-notations*, to define the structural patterns, logical dependencies, and interactions. Also, 3P-ESDL describes the related elements of message, interface and binding. The description elements includes *informationType* (for information), *token* and *tokenLocator* (for information abstraction), *staticInterface* and *operation* (for implementation interface), *binding* (for protocols), and *serviceEndpoint* and *clientEndpoint* (for network location).

Service/partner broker – we reference to SOA, where UDDI is often used for registry broker. However, UDDI does not take partnership and interaction among clients into account. We therefore enhanced *bindingTemplate* and *tModels* with respect to 3P-ESDL. Moreover, we constructed a data structure for *service requestor* (descriptive information about the party who gets served), *served client* (descriptive information about a particular family of technical clients), *business partnership* (descriptive information about the role of clients and the partnership) and *interaction* (descriptive information about the interaction with involved clients), as well as the related technical information.

The partner broker, in this example, manages a tabulation of different logistics parties and facilitates the partner formation process with a simple first-come-first-serve partnering method. Other clients of different business roles for this shipment planning e-Service can quickly access the e-Service through different designated interfaces (i.e., carry out the binding process defined in the 3P-SOA architecture – native to SOA). The shipment planning e-Service serves the clients in a 3rd party capacity, facilitating interactions among these clients as requested, leading to the forwarder to reach a viable solution with integration and/or consolidation.

6.2 Validation of the IT Artifact

The IT artifact is able to allow clients request for a shipping service and form collaborative partners and interact with them through our IT artifact. This demonstrates that the IT artifact is able to satisfy the requirements of the aforementioned case. Albeit the IT artifact is a prototype, it does demonstrate that the proposed 3P-SOA is capable of satisfying the 3rd party e-Service requirements. For instance, the IT artifact allows a single e-Service to be used by multiple clients, e.g. client, sea transporter, and air transporter to interact (principle 3.1). Moreover, the IT artifact allows the client to 'locate' potential logistic service providers that fit the shipment (principle 3.2). Finally, the IT artifact is neutral to all clients, as the roles and tasks of each party are clearly described, i.e., transparent to all concerned; yet the interactivity is privileged only to those in the communication as facilitated (principle #3.3). Obviously, further refinements to 3P-SOA and a more complex case setting can further enrich our technical understanding of 3P-SOA.

7. CONCLUSIONS

In this study we used an abductive DSR lens to explore the evolution of e-Service in an e-business context and explain it accordingly through our 1st and 2nd party e-Service concepts. Moreover, we advocate that value co-creation ushers the need for a new type of e-Service that requires multiple interacting clients rather than a single designated client – 3rd party e-Service. In order to catalyze

3rd party e-Service development we proposed design principles and a 3P-SOA architecture for system designers and developers to embark on. Finally, we demonstrated a prototype based on the 3rd party e-Service design principles, in order to resolve a shipment problem scenario.

This study is one of the few to use an abductive DSR approach. The abductive DSR approach illustrates that abductive reasoning can discover a new class of potential problem and extend the existing e-Service understanding. 3P-SOA is proposed and is a first attempt to satisfy 3rd party e-Service needs, which can hopefully form as a platform for other academia and practitioners to build upon. However, unlike Fischer et al. suggested [14], abductive DSR can also be used in existing problems which have simple not been solved.

For future research, more work is needed on the enabling technologies we prescribed and put them into practice. For example, one can develop the comprehensive methods for partner formation, or refine the description language for collaboration. It would be interesting to see the development and emergence of commercial third-party e-Services as instantiations in accordance with the proposed design principles. Moreover, it should be worthwhile to propose a process view for developing a design science research by articulating the existing views on design science, design theory and artifact along the foundational premises of S-D logic. Lastly, one would contemplate the notion of Nth-party e-Service.

REFERENCES

[1] Abbasi, A. and Chen, H. 2008. "Cybergate: A Design Framework and System for Text Analysis of Computer-Mediated Communication," MIS Quarterly (32:4), pp. 811-837.

[2] Ai-Natour, S. and Benbasat, I. 2009. "The Adoption and Use of IT Artifacts: A New Interaction-Centric Model for the Study of User-Artifact Relationships," Journal of the Association for Information Systems (10:9), pp. 661-685.

[3] Au, Y.A. 2001. "Design Science I: The Role of Design Science in Electronic Commerce Research," Communication of AIS (7: article 1), pp. 1-17.

[4] Barrett, M. and Davidson, E. 2008. "Exploring the Diversity of Service Worlds in the Service Economy," in IFIP International Federation for Information Processing, Volume 267, Information Technology in the Service Economy: Challenges and Possibilities for the 21st Century, eds. Barrett, M., Davidson, E., Middleton, C. and DeGross, J. (Boston: Springer), pp. 1-10.

[5] Bih, J. 2006. "Service Oriented Architecture (SOA) A New Paradigm to Implement Dynamic e-Business Solutions," Communications of the ACM (7: 30), Article 4.

[6] Brereton, P., Budgen, D., Bennnett, K., Munro, M., Layzell, P., MaCaulay, L., Griffiths, D. and Stannett, C. 1999. "The Future of Software," Communications of the ACM (42:12), pp. 78-84.

[7] Broadbent, M., Weill, P. and St. Clair, D. 1999. "The Implications of Information Technology Infrastructure for Business Process Redesign," MIS Quarterly (23:2), pp. 159-182.

[8] Burbeck, S. 2000. "The Tao of e-Business Services," IBM, http://www-4.ibm.com/software/developer/library/ws-tao/index.html, visited on May 2012.

[9] Channabasavaiah, K., Holley, K., Tuggle, Jr. E. 2003. "Migrating to a Service-Oriented Architecture, Part 1," IBM, http://www.ibm.com/developerworks/library/ws-migratesoa/ visited on May 2012.

[10] Chen, C., Wu, C. and Wu, R.C. 2006. "e-Service Enhancement Priority Matrix: The Case of an IC Foundry Company," Information & Management (43:5), pp. 572-586.

[11] Chesbrough, H. and Spohrer, J. 2006. "A Research Manifesto for Services Science," Communications of the ACM (49:7), pp. 35-40.

[12] Currie, W. L. and Seltsikas P. 2001. "Exploring the Supply-side of IT Outsourcing: Evaluating the Emerging Role of Application Service Providers," European Journal of Information Systems (10:3), pp. 123-134.

[13] Foster, I. 2005. "Service-Oriented Science," Science (308:5723), pp. 814-817.

[14] Fischer, C., Gregor, S., Aier, S. 2012. "Forms of Discovery for Design Knowledge", Proceedings of ECIS2012, pp. 2-14.

[15] Hevner, A. R., March, S. T., Park J., and Ram, S. 2004. "Design Science in Information Systems Research," MIS Quarterly (28:1), pp. 75-105.

[16] Hoffman, K. D. 2003. "Marketing + MIS = e-Service," Communications of the ACM (46:6), pp. 53-55.

[17] Horowitz, E. 1998. "Migrating Software to The World Wide Web," IEEE Software (15:3), pp. 18-21.

[18] Leung, L. C., Hui, Y. V., Wang, Y. and Chen, G. 2009. "A 0-1 LP Model for the Integration and Consolidation of Air Cargo Shipments," Operations Research (57:2), pp. 402-412.

[19] Lindenberg, J., Pasman, W., Kranenborg, K., Stegeman, J. and Neerincx, M. A. 2007. "Improving Service Matching and Selection in Ubiquitous Computing Environments: A User Study," Personal and Ubiquitous Computing (11:1), pp. 59-68.

[20] Mohr, J. and Spekman, R. E.1994. "Characteristics of Partnership Success: Partnership Attributes, Communications Behavior, and Conflict Resolution Techniques," Strategic Management Journal (15), pp.135-52.

[21] Natis, Y. V. and Schulte, R. W. 2003. "Introduction to Service-Oriented Architecture", Gartner Research, ID Number: SPA-19-5971, http://www.gartner.com/DisplayDocument?doc_cd=114295, visited on May 2012.

[22] Simon, H. A. 1996. The Sciences of the Artificial (3rd ed.), MIT Press, Cambridge, MA.

[23] Spohrer, J. and Kwan, S.K. 2009. "Service Science, Management, Engineering, and Design (SSMED): An Emerging Discipline – Outline & References," International Journal of Information Systems in the Service Sector (1:3) pp. 1-31.

[24] Spohrer, J., Maglio, P. P., Bailey, J. and Gruhl, D. 2007. "Steps towards a Science of Service Systems," IEEE Computer (40:1), pp. 71-77.

[25] Turner, M., Budgen, D. and Brereton, P. 2003. "Turning Software into a Service," IEEE Computer (36:10), pp. 38-44.

[26] Tuten, T. L. and Urban, D. J. 2001. "An Expanded Model of Business-to-Business Partnership Formation and Success," Industrial Marketing Management (30), pp. 149-164.

[27] Vaishnavi, V.K. and Kuechler Jr., W. 2008. Design Science Research Methods and Patterns: Innovating Information and Communication Technology, Auerbach Publications.

[28] Vargo, S. L. and Lusch, R. F. 2004. "Evolving to A New Dominant Logic for Marketing," Journal of Marketing (68), pp. 1–17.

[29] Walls, J.G., Widmeyer, G.R. and El Sawy, O. A. 1992. "Building an Information System Design Theory for Vigilant EIS," Information Systems Research (3:1), pp. 36-59.

[30] Walsh, K.R. 2003. "Analyzing the Application ASP Concept: Technologies, Economies, and Strategies," Communications of the ACM (46:8), pp. 103-107.

[31] Womack, J.P. and Jones, D.T. 2005, Lean Solutions: How Companies and Customers Can Create Value and Wealth Together, Free Press: New York, NY.