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# Critical Analysis of the Use of Absorptive Capacity Theory in IS Research

*Completed Research Paper*

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## **Abstract**

*This paper critically analyzes the use of Absorptive Capacity (ACAP) theory in information systems (IS) research. Drawing on a comprehensive review of the evolution of ACAP theory and models for the construct, we empirically investigate a number of ACAP-related papers published in reputable IS journals. The analysis involves four main areas: 1) summary analysis of ACAP in IS papers; 2) domains of ACAP usage; 3) analysis of hypotheses to show how ACAP is being used to explain various organizational phenomena in IS research; and 4) analysis of measures to gain insights into the operationalization of ACAP in IS research. This research advocates that organization-level ACAP should be applied as the dependent variable in studying the impact of IS. Furthermore, ACAP should be conceptualized as a “capability,” rather than an “asset.” This paper contributes to IS and ACAP studies by investigating and clearly specifying the utility of ACAP in IS research.*

**Keywords:** Absorptive Capacity (ACAP), Information Systems (IS) Research, Critical Analysis

## Introduction

In a competitive business environment, organizations are compelled to evolve constantly by various market forces (Lane et al., 2006). The evolution of organizations is highly dependent on their ability to source, manage, and exploit knowledge. Organizations comprise networks of tacit knowledge that are critical to the creation and maintenance of their intellectual property, products, and services. Some of this knowledge is embedded ubiquitously and pervasively throughout the organization. Organizations, through their members, also have access to knowledge outside of the traditional organizational boundaries. Information from both internal and external knowledge sources, if recognized as useful information (Choudhury and Sampler, 1997) and exploited effectively, may help the organization to achieve a competitive advantage. To exploit such knowledge, an organization must be aware of the need for, and possess, sufficient absorptive capacity (Cohen and Levinthal, 1990).

Absorptive Capacity (ACAP) was first described in academic literature in the fields of management and organizational science as a construct for consideration at the organizational level by Cohen and Levinthal (1990). Cohen and Levinthal (1990) proposed the original measure for ACAP as “Research and Development (R&D) intensity,” which was formulated as business unit-funded R&D expenditure expressed as a percentage of business unit sales and transfers. While Cohen and Levinthal (1990) suggest that the cognitive abilities of individual members are critical to ACAP at the organizational level, ACAP is generally regarded as an organizational-level construct (Lane et al., 2006; Todorova and Durisin, 2007; Zahra and George, 2002). With the ubiquitous and pervasive nature of knowledge in organizations, the rapid convergence and diffusion of computing, communications, and content technologies offer organizations significant opportunities to enhance organizational ACAP (Roberts et al., 2012). Nonetheless, Zahra and George (2002) acknowledge that, while there is a diverse use of and reference to ACAP in the literature, there is also much ambiguity in the description of its measurement, definitions, components, antecedents, and outcomes.

ACAP is an important theory in information systems (IS) research. Organizations are dedicating more of their allowed expenditure to services, software, infrastructure, and human resource enhancement with the aim of developing the absorptive, retentive, and exploitative capabilities to use with acquired knowledge. Organizations are thereby able to achieve and sustain their competitive advantage (Armstrong and Sambamurthy, 1999). This applies both to the organization’s understanding of its operations, in terms of process and the management of its product and service offerings, as well as to its understanding of the “state of the art” in IS. Being close to the cutting edge of IS, through continual research and investment in technology assets and capabilities, will enable the organization to continually learn and absorb external knowledge to improve its ACAP. Understanding how researchers observe and explain the extent of organizational ACAP and its relationship with various aspects of IS is critical to the ability to prescribe methods and constructs that organizations can utilize to develop this capability. Although ACAP has been applied broadly in IS research, Roberts et al. (2012) is the only paper reviewed and synthesized the role of ACAP in IS research by exploring ACAP at the theoretical level. In fact, Roberts et al. (2012) make an argument for the misconceptualization of ACAP. They suggest that, while the general consensus among the IS research community is that ACAP should be regarded as an organizational “capability,” many are operationalizing it in their research as an “asset.” In other words, there is a myriad of interpretations and applications of ACAP theory by researchers.

In response to these issues, the aim of this paper is therefore to critically analyze the use of ACAP in IS research. This is achieved by empirically examining the applications of ACAP theory in IS research in order to show the extent to which the theory has been applied in the explanation of various organizational phenomena. This paper complements the work of Roberts et al. (2012); however, while Roberts et al. target a smaller group of journals (nine top journals), this paper includes all A\* and A journals (52 journals) listed by the Australian Council of Professors and Heads of Information Systems (ACPHIS), thus providing a more comprehensive view of the articles that use ACAP. Furthermore, this paper focuses only on those articles that use ACAP in its core development, while Roberts et al. (2012) include every article that uses ACAP, even if it is only a minor citation. Both papers conduct analyses of the role of ACAP in IS research, the unit of analysis where ACAP is being applied, and the operationalization and measures of ACAP; however, the cross-tabulation analyses presented in this paper give a more comprehensive synthesis on the application of ACAP than that given by Roberts et al. (2012). Additionally, this paper

presents an analysis of how ACAP is being cast in the articles as either a dependent or an independent variable or as a mediator, an analysis which is absent in Roberts et al. (2012).

The remainder of this paper is structured as follows: the next section presents the ACAP literature review before outlining the elements of the ACAP models; the third section describes the research method used to conduct the review and the analysis of the application of ACAP in IS research; the fourth section provides the research findings; and the last section concludes the study and suggests directions for future research.

## **Literature Review**

To provide context for the analysis, we conduct a comprehensive review of the ACAP literature and provide a theoretical foundation, definitions, and concepts for ACAP. This is achieved by analyzing the definitions for ACAP and exploring the evolution of theory and models for the construct since the seminal work of Cohen and Levinthal (1990). The construct will be discussed in light of its antecedents, components, contingent factors, and outcomes in order to give a comprehensive summary of the richness and complexity of ACAP theory. This review highlights the critical issues in ACAP, forms the basis of the development of the coding book and the database used to analyze the papers describing the application of ACAP in IS research. The literature review is presented first in chronological order and is followed by a summary of the elements of the five renowned ACAP models.

### ***ACAP Definitions and Models***

This sub-section outlines five contributions to ACAP since the inception of the theory, beginning with the seminal work of Cohen and Levinthal (1990), followed by the model and conceptual developments of Zahra and George (2002), Lane et al. (2006), Todorova and Durisin (2007), and Volberda et al. (2010).

In their seminal work, Cohen and Levinthal (1990) define ACAP as a firm's ability to: (1) recognize the value of, (2) assimilate, and (3) apply new external information to commercial ends. Cohen and Levinthal argue that ACAP is a function of the firm's prior related and complimentary knowledge. They emphasize that such capacity is path dependent and critical to innovative performance and allude to the importance of "recognizing the value" of new external information by implying that this is difficult without prior knowledge. In terms of "assimilation," Cohen and Levinthal argue that the impact of individual members on the firm's ACAP is significant and critical to embedding new external information throughout the organization, citing research in cognitive and behavioral sciences that underlies learning and knowledge acquisition. . This suggests that ACAP is dependent on the collective prior knowledge of its individuals and that the firm's ACAP can be enriched by investing in the ACAP of individuals by investing in R&D, thus widening the potential interface between sources of external information and social networks within the firm. Consequently, the "assimilation" component of ACAP encompasses the firm's ability to transform, re-configure, and re-deploy resources in order to be ready to exploit new external information. Cohen and Levinthal also recognize that, while the knowledge of individuals is important, ACAP "assimilation" is also dependent on the efficient proliferation and socialization of new external information in the firm, thus emphasizing that knowledge retention into corporate memory is best facilitated by investing in and encouraging communication among firm sub-units. Cohen and Levinthal describe "applying new external information" as the exploitation of the newly acquired knowledge for commercial benefit to the organization based on technological opportunity, the volume of external knowledge available, and on the "regimes of appropriability" (innovation protection mechanisms that create a barrier between the organization and valuable external knowledge). They further argue that such exploitation of new external information is a critical component of a firm's innovative capabilities.

Zahra and George (2002) modify and extend the ideas put forward by Cohen and Levinthal (1990) by specifying four distinct dimensions of ACAP: (1) "acquisition," (2) "assimilation," (3) "transformation," and (4) "exploitation." However, Zahra and George notably do not refer to "recognizing the value," as Cohen and Levinthal (1990) do. Zahra and George (2002) provide a definition for ACAP in their "reconceptualization" paper, preferring to describe ACAP as "... a dynamic capability pertaining to knowledge creation and utilization that enhances a firm's ability to gain and sustain a competitive advantage" (p. 189). They also acknowledge that such capabilities are embedded deeply in the firm's processes. While this definition is similar to that provided by Cohen and Levinthal (1990), Zahra and

George make some notable modifications to the model, arguing that the ACAP construct comprises two significant sub-set components. First, *potential* ACAP (PACAP), which comprises the dimensions of “acquisition” (new to ACAP) and “assimilation” (as per Cohen and Levinthal, 1990). Second, *realized* ACAP (RACAP), which comprises the commercial “exploitation” dimension (as per Cohen and Levinthal, 1990), as well as the “transformation” dimension (new to ACAP), which is critical to a firm’s RACAP (and subsequently its ACAP). “Acquisition” appears to have taken the place of Cohen and Levinthal’s “recognizing the value”; it refers to an organization’s ability to identify and acquire externally generated knowledge (Zahra and George, 2002). “Transformation” denotes a firm’s ability to develop and refine the processes that enable the combination of existing knowledge and newly acquired and assimilated knowledge (Zahra and George, 2002). With these two sub-set components, Zahra and George focus on an “efficiency view” of ACAP; that is, its efficiency in reducing the gap between the organization’s PACAP and its RACAP. Put simply, a firm can, at best, only transform and exploit as much knowledge as it has acquired and assimilated and the innovating firm should therefore aim to maximize the ratio of RACAP to PACAP.

Lane, Koka, and Pathak (2006) posit that ACAP research has undergone an inappropriate deviation from the original purpose of the construct proposed by Cohen and Levinthal (1990). Lane et al. identify five critical assumptions that have developed in the research since 1990, which they argue have contributed to the deviation of ACAP. As a result, Lane et al. propose a new definition to rejuvenate ACAP and realign it with its original intention. While building on the later work of Cohen and Levinthal (1994), where it was recognized that ACAP allowed firms to better predict the nature of technological advances, Lane et al. also acknowledge the “efficiency view” proposed by Zahra and George (2002) which emphasizes the importance of reducing the gap between PACAP and RACAP. Lane et al. then define ACAP as “a firm’s ability to utilize externally held knowledge through three sequential processes: (1) recognizing and understanding potentially valuable new knowledge outside the firm through exploratory learning, (2) assimilating valuable new knowledge through transformative learning, and (3) using the assimilated knowledge to create new knowledge and commercial outputs through exploitative learning” (p. 856). This definition rolls back the transformational component of the ACAP model proposed by Zahra and George (2002) to that proposed originally by Cohen and Levinthal (1990; 1994). Lane et al. justify this regression by suggesting that “transformation” is incorporated and assumed in the “assimilation” and “exploitation” components of their model.

Todorova and Durisin (2007) argue that there are serious ambiguities and omissions in Zahra and George’s (2002) reconceptualization of the ACAP construct. Todorova and Durisin argue that, in light of the work of Cohen and Levinthal (1990), both the removal of the “recognizing the value” dimension from the construct, as well as the positioning of the “acquisition” dimension, are inappropriate. In addition, Todorova and Durisin suggest that the “transformation” dimension, a component of RACAP according to Zahra and George (2002), is not a consequence of the PACAP components “acquisition” and “assimilation.” Instead, the component views are deconstructed to show that “transformation” and “assimilation” are alternately (and interactively) consequential to the “acquisition” antecedent and are, in turn, antecedent to the “exploitation” dimension. Todorova and Durisin also acknowledge that the contingent factors described by Zahra and George (2002), including “regimes of appropriability,” “activation triggers,” and “social integration mechanisms,” have a significant effect on the construct. They argue, however, that these contingent factors influence different components of the construct and also introduce other contingent factors such as “power relationships” (Todorova and Durisin, 2007). As a result of the above-mentioned re-assignment of ACAP components, Todorova and Durisin also call into question the splitting of the construct into sub-sets of PACAP and RACAP.

Volberda, Foss, and Lyles (2010) propose an integrative framework for ACAP based largely on Zahra and George’s 2002 model; however, their most important contribution to ACAP theory is the emphasis on multilevel antecedents and contingent factors that influence the outcomes of organizational ACAP. After conducting a bibliometric analysis on ACAP, Volberda et al. suggest that there is a need to consider “intra-organizational antecedents” and “managerial antecedents” as significant drivers of organizational ACAP. “Intra-organizational antecedents” refer to the structure of the organization and how that structure aids in the accomplishment of knowledge-related tasks (Volberda et al., 2010). These drivers include organizational form, incentive structures, informal networks, and the facility for internal communication within the organization, all of which are crucial to the proliferation of newly acquired knowledge.

“Managerial antecedents” refer to the influential capability that the cognitions and dominant logic of management has over the proliferation of knowledge throughout the organization (Volberda et al., 2010).

### Summary of Model Elements

This sub-section provides a tabular synthesis of the above-mentioned models by collecting the components of the respective models and categorizing them according to type: antecedent, component, outcome or contingent factor. The tabular form of the model summary highlights the similarities and notable differences between the models reviewed, allowing for direct comparisons to be made and for an enriched understanding of the considerations in each part of the theory as it has evolved.

#### Antecedents

The elements of the above-mentioned definitions and models have been captured and synthesized in Figure 1 in order to understand any commonalities and differences among the models reviewed. The cells highlighted in dark grey indicate a commonality between all five of the ACAP models described in this paper. There appears to be agreement among researchers in this sample regarding ACAP antecedents, such as “inter-organizational factors” and “prior knowledge”; however, there is minimal agreement on other observed antecedent factors.

Article	Year	Model Components																													
		Antecedents					ACAP Components					Contingent Factors					Outcomes														
		Knowledge Source / Complementarity / Interorganizational Antecedents		Prior Knowledge	Intraorganizational Antecedents	Managerial Antecedents	Learning Relationships / Individual Development	Environmental Conditions / Incentives	PACAP	RACAP	Recognizing the Value	Acquire	Assimilate	Transform	Apply/Exploit	Regimes of Appropriability	Activation Triggers	Social Integration Mechanisms	Environmental Conditions	Organizational Mental Models	Organizational Strategies	Organizational Structures and Processes	Power Relationships	Innovation	Innovative Performance	Knowledge Outputs	Exploitation / Exploration	Commercial Outputs	Flexibility	Performance	Competitive Advantage
Cohen and Levinthal	1990	X	X							X		X		X	X									X	X						
Zahra and George	2002	X	X					X	X		X	X	X	X	X	X	X							X					X	X	X
Lane et al.	2006	X	X			X	X			X		X		X					X	X	X					X		X		X	
Todorova and Durisin	2007	X	X							X	X	X	X	X	X	X	X						X	X					X	X	X
Volberda et al.	2010	X	X	X	X	X	X	X	X		X	X	X	X	X	X		X					X				X			X	X

**Figure 1. Summary of ACAP Theory Model Elements**

*Note: Dark grey highlights show common views among all researchers in the sample; light grey highlights a majority view.*

#### ACAP Components

All of the models reviewed consider “assimilate” and “apply” as components of ACAP, while a majority of papers reviewed also consider “recognizing the value,” “acquisition,” and “transformation” as important components (light grey highlighted cells). Zahra and George (2002) argue that “acquisition” incorporates and implies aspects of “recognizing the value,” while Lane et al. (2006) suggest that “transformation” is embedded within “assimilation”. The model proposed by Volberda et al. (2010) is based on that of Zahra and George (2002) and, as such, these are the only two papers that recognize the two sub-set components of ACAP (PACAP and RACAP).

#### Contingent Factors

Contingent factors are those thought to mediate or moderate the relationship between ACAP and its antecedents and outcomes. There is less agreement among the scholars on contingent factors than there is on antecedents and ACAP components, although most researchers agree that “regimes of appropriability” are a significant mediating factor. Cohen and Levinthal (1990) view “regimes of appropriability” as a mediating factor between ACAP antecedents and ACAP, taking the view that new external information as

a source is limited by the intellectual property protection mechanisms implemented by rival organizations to provide an effective barrier to knowledge transfer. Alternatively, Zahra and George (2002) suggest that “regimes of appropriability” mediate the relationship between ACAP and its outcomes, implying that the barrier lies not in the transferal of knowledge from an external source to the organization, but rather in the application and exploitation of that knowledge in achieving a desired outcome. Todorova and Durisin (2007) acknowledge both of these views.

## Outcomes

The majority of the researchers in the sample agree that “innovation,” “performance,” and “competitive advantage” are significant outcomes of ACAP. OECD (2005, p.46) defines innovation as “the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations.” *Performance* is widely viewed as the accomplishment of a given task measured against predetermined standards of accuracy, completeness, cost, and speed. In the context of ACAP, researchers tend to focus on the relationship of innovative performance as a driver of business performance (Cohen and Levinthal, 1990) and how ACAP can enhance the business performance of an organization.

“Competitive advantage” is an advantage that a firm has over its competitors, allowing it to generate greater commercial output (sales, profits, or market share) than its competition. There can be many types of “competitive advantage,” including the organization’s cost structure, product offerings, distribution network, and customer support. “Competitive advantage” can be sustained when resources are rare, valuable, inimitable and non-substitutable (Barney, 2001; Zahra and George, 2002).

## Research Method

Drawing on the literature review, this study seeks to provide perspectives on the application of ACAP theory in IS research. The sample of papers has been specifically selected from peer-reviewed, academic journals that have been ranked by the ACPHIS. For reasons of manageability, the sample was limited to A\* and A journals. Moreover, journals with this classification are regarded as highly reputable among IS researchers and, as such, papers published in these journals are likely to contain high quality research and make significant contributions to the body of knowledge. Another requirement for the selection of the papers was that any reference to ACAP must have, at the very least, assisted in the development of the logic for the paper’s hypotheses and/or research models. Papers that only contained a minor or background reference to seminal ACAP theory were not retained for review. All of the papers referenced and read in the preparation of this paper were sourced from four data locations: (1) ISI Web of Knowledge, (2) Scopus, (3) University e-Library, and (4) Google Scholar. “Absorptive Capacity” was used as a search term and the period of publication was specified as between 1990 and 2013

## Data Collection

The data collection was conducted in two stages that addressed the search for evidence of the application of ACAP in IS research. In the first stage, the search was limited to the 13 A\* IS journals, as per the ACPHIS listing. The use of the search term “Absorptive Capacity” across all fields in the various source databases yielded 209 papers, for which the PDFs were downloaded and the citations exported to the Endnote database. A research matrix was created in accordance with the coding protocol developed (see the following section of this article) to be able to classify and summarize the papers reviewed, as suggested in Webster and Watson (2002). The 209 papers with an ACPHIS ranking of A\* were reviewed to determine which papers contained more than just a minor or background citation of seminal works on ACAP. This was done in accordance with Roberts et al.’s (2012) recommendation, categorizing the ACAP in IS research papers based on whether they used ACAP in a way that either (1) provided theoretical support (e.g., Overby et al. (2006)), (2) formed part of a hypothesis or proposition, or (3) formed the theoretical base of the research model and motivated the study (e.g., Arnold et al. (2010); Malhotra et al. (2005); Park et al. (2007)). Any papers that could not be categorized into these three groups were discarded because ACAP only featured as a background or minor citation in the studies.

Of the 209 A\* papers, the reference to ACAP in 183 papers was classed as background or minor, leaving 26 papers of interest for further review and analysis (representing a “useful” paper success rate of



approximately 12.4%). On reflection, this percentage was low due to the broad “all-fields” search criteria used and, therefore, when searching for papers in ACPHIS A journals during the second stage, the search string of “Absorptive Capacity” was restricted to the “article title” and “abstract” fields only. This proved to be an effective and systematic means of eliminating as many papers that had only a background or minor reference to ACAP as possible, with minimal review effort, and accelerated the sample selection process. The second stage selection process initially yielded 21 A papers, of which 13 papers were finally analyzed after shortlisting. This brought the total number of ACAP in IS research papers across the A\*- and A-ranked IS journals to 39 papers of interest for further review and analysis.

### ***Development of Coding Protocol and Data Recording***

The papers were coded for various quantitative and qualitative attributes in a spreadsheet and some generic bibliographic attributes were recorded for all of the reviewed papers. The Unit(s) of Analysis (UoA) of each paper was also recorded in order to confirm the pattern suggested by Zahra and George (2002)—that the majority of the studies examine ACAP at the organizational level—and also to observe any change in the pattern since. The conceptualization of ACAP was also noted in order to observe Roberts et al.’s (2012) claim that the majority of researchers conceptualize ACAP as a “capability,” despite operationalizing it in their research as an “asset.” The research and data collection methods were recorded to determine the validity and generalizability of the results in the papers studied. In addition to the common attributes recorded from each paper, the components of the ACAP models acknowledged were also reviewed and recorded, thus enabling the evaluation of the contribution to ACAP theory made by each paper.

In the papers that applied ACAP theory, the role of ACAP in the paper was noted as a means of ensuring that all of the reviewed ACAP in IS research studies used ACAP in a significant way (rather than as a background or minor citation). The ACAP in IS research papers were coded for the same attributes as the ACAP theory papers. Moreover, the papers were coded perceptually for “technical domain” and “behavioral domain” to be able to show the context within which the research was being conducted. “Technical domain” refers to the technology or body of knowledge that is central to the thesis of the paper, while the “behavioral domain” denotes the activity or manipulation of the “technical domain” studied. The ACAP-related hypotheses and propositions were recorded in a separate spreadsheet in order to be able to understand the type of IS and organizational phenomena studied and to examine how ACAP theory is applied in that research. This enables the deconstruction of the research models, analysis of the variables posited, and the ability to show whether ACAP influences the IS phenomena studied or, alternatively, whether the IS phenomena are influencing organizational ACAP. Another separate spreadsheet was created and maintained to record the instruments of measurement (survey and interview questions) pertaining to the aspects of ACAP evident in the papers. This gives an insight into the nature of the measurement of ACAP and how it interacts with conceptualization and operationalization of the theory in the papers. All analysis was conducted using Microsoft Excel and was cross-checked by the research team.

## **Findings of ACAP Use in IS Research**

This section provides an analysis of the data collected from ACAP-related journal papers in IS research. It focuses on four main areas: (1) a summary analysis of ACAP in IS research; (2) the domains for ACAP usage in IS; (3) an analysis of the hypotheses (to demonstrate how ACAP is being used to explain various organizational phenomena in IS research); and (4) an analysis of the instruments of measurement (to give some insights into the operationalization of the ACAP in IS research).

### ***Summary Analysis of ACAP in IS Research Papers***

The following analysis summarizes the different aspects of ACAP in IS research to give a general understanding of the UoA examined in the papers and the papers’ conceptualization of ACAP.

First, Zahra and George (2002) note that ACAP was studied primarily at the organizational UoA level in academic literature and their claim is supported by the sample of papers for ACAP in IS research reviewed. As shown in Figure 2, 36% (14) of the papers reviewed show evidence of organization-level research, with a further 44% (17) of papers conducting research at multiple UoA, the majority of which



contain organizational-level analysis. It is also evident that, in the majority of papers reviewed (54%, 21 papers), ACAP plays a significant role in the thesis of the paper.

Unit of Analysis	Role of ACAP in Article			Total	%
	Forms theoretical base for the article	Used in hypothesis, proposition or research model	Provides theoretical support		
Multi	11	2	4	17	44%
Organization	6	4	4	14	36%
Other	3	2		5	13%
Individual	1	1		2	5%
Group			1	1	3%
<b>Total</b>	<b>21</b>	<b>9</b>	<b>9</b>	<b>39</b>	<b>100%</b>
<b>Percentage</b>	<b>54%</b>	<b>23%</b>	<b>23%</b>	<b>100%</b>	

**Figure 2. Analysis of UoA and Role of ACAP in IS Research**

Second, the UoA is cross-tabulated with the ACAP conceptualization of the papers (see Figure 3). Conceptualization is the process of developing clear, rigorous, and systematic conceptual definitions for abstract ideas and concepts (Neuman, 2009) and is an important aspect of developing a theory. Lane et al. (2006) recognize that there are two main conceptualizations of ACAP in academic literature: “asset” and “capability.” The “asset” conceptualization—or that which describes ACAP as a stock of prior knowledge—is typically operationalized with variables that serve as determinants for the quantum of the organization’s knowledge base at any time. Cohen and Levinthal (1990) suggest that R&D intensity and patents are indicative measures of organizational ACAP, while Szulanski (1996), one of the more frequently cited papers as a source of instruments of measurement for ACAP research, proposes a survey question designed to gauge participants’ perceptions of whether the organization possesses “state of the art” information for a given industry. Szulanski (1996) is also interested in knowing whether survey participants have the common language, necessary skills, and competencies to absorb a new work practice. These variables are an indirect measurement of an individual’s prior knowledge and, by extension, of prior knowledge of the organization and thus provide further evidence of operationalized measures of ACAP based on an “asset” conceptualization. However, if the questions were re-phrased to enquire whether survey participants have the “ability” to acquire the common language, necessary skills, and competencies, then it would be possible to consider the questions as a measurement of a “capability”-based conceptualization of ACAP.

The “capability” conceptualization of ACAP implies a set of routines and processes used to identify, assimilate, transform, and apply external knowledge (Lane et al., 2006). The routines and processes refer to the creation, extension, or modification of the organization’s resource base or existing capabilities. Measures that operationalize the “capability” conceptualization of ACAP tend to focus on dominant logic (at the management level), knowledge-sharing routines, and competencies (Szulanski, 1996; Volberda et al., 2010). These measures are often survey-based and often rely on perceptual understanding, rather than direct measurement. Szulanski (1996) poses some “capability”-based survey questions enquiring as to whether participants have a vision of what is to be achieved by implementing a certain work practice; another question enquires whether there is a clear division of roles in the implementation and whether it is known who is best positioned in the organization to exploit new knowledge.

Count of Papers	Unit of Analysis					Total	%
ACAP Conceptualization	Multi	Organization	Other	Individual	Group		
Capability	16	12	4	2		34	87%
Asset and Capability	1	2	1			4	10%
Asset					1	1	3%
<b>Total</b>	<b>17</b>	<b>14</b>	<b>5</b>	<b>2</b>	<b>1</b>	<b>39</b>	<b>100%</b>
<b>Percentage</b>	<b>44%</b>	<b>36%</b>	<b>13%</b>	<b>5%</b>	<b>3%</b>	<b>100%</b>	

**Figure 3. Cross-Tabulation of ACAP Conceptualization with Unit of Analysis**

As shown in Figure 3, the majority of researchers (87%) conceptualize ACAP as a “capability” that is distinct from ACAP as an “asset.” Misconceptualization represents a significant risk for research as it is possible that operationalization may not strictly adhere to the intended conceptualization, presenting potential construct validity issues. This research shows that a small number of papers conceptualize ACAP as both an “asset” and a “capability,” thereby presenting construct validity and measurement issues. Notably, the only paper that describes research at the group (or sub-unit) level was also the only paper to distinctly conceptualize ACAP as an “asset” (see Boynton et al., 1994).

### Analysis of Domains

ACAP theory has been applied widely in IS research. When reviewing papers in the sample, it was necessary to attempt to categorize the papers in terms of their domains; in particular, the technical and behavioral domains relevant to the study. The “technical domain” refers to the IS area of interest, which can be a specific technology or group of technologies, such as Enterprise Resource Planning (ERP)/Enterprise Systems, or a specific academic research area or body of knowledge, such as knowledge management. The “behavioral domain” refers to some activity, manipulation, or application of the “technical domain.” An example of such a domain is “utilization,” which is a key area for research and one of the major challenges to the “adoption” and “assimilation” of enterprise systems in practice.

Count of Papers	Technical Domain							Total	%
Behavioral Domain	Knowledge Management / KMS / Collaborative Technology	ERP / Enterprise Systems / Platforms	Software Development	IT Governance / Organization	DW / BI / DSS / CRM	B2B / E-commerce / Internet	Other		
Knowledge Transfer / Sharing / Creation	8	2	1			1		12	31%
Utilization		3	2	1	1	2		9	23%
Adoption / Implementation / Integration		3		2	1		1	7	18%
Other	1			1	1		2	5	13%
Innovation	3	1						4	10%
Offshoring / Outsourcing	1		1					2	5%
<b>Total</b>	<b>13</b>	<b>9</b>	<b>4</b>	<b>4</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>39</b>	<b>100%</b>
<b>Percentage</b>	<b>33%</b>	<b>23%</b>	<b>10%</b>	<b>10%</b>	<b>8%</b>	<b>8%</b>	<b>8%</b>	<b>100%</b>	

**Figure 4. Cross-Tabulation of Technical Domain and Behavioral Domain**

This level of categorization is useful in order to understand where ACAP is being used in IS research. Figure 4 indicates that the most prevalent “technical domains” observed using ACAP in IS research in the sample are “Knowledge Management/Knowledge Management Systems (KMS)/Collaborative Technology” and “ERP/Enterprise Systems/Platforms”; these “technical domains” account for 56% of the papers (22 in total) in the sample. It was also observed that, in conjunction with these “technical domains,” the “behavioral domains” of “Knowledge Transfer/Sharing/Creation,” “Utilization” (of IS), and “Adoption/Implementation/Integration” were most prevalent in the sample at 72% (28 in total).

Notably, with the increased spending on business intelligence (BI) and associated technologies (e.g., data warehousing (DW), decision support systems (DSS), customer relationship management (CRM)) in organizations, there are relatively few papers investigating the impact of ACAP in “DW/BI/DSS/CRM” domain and, more importantly, the impact that this domain has on organizational ACAP. Gartner’s worldwide surveys of information technology (IT) spending have shown that BI is one of the top technology priorities for many Chief Information Officers (CIOs) and predicts that BI and analytics will remain the top focus for CIOs until 2017 (Gartner Inc., 2013). However, only a few of the papers in the sample were categorized within this “technical domain” (“DW/BI/DSS/CRM”).

### Analysis of Hypotheses

By collecting and analyzing the hypotheses of the ACAP in IS research papers, it is possible to understand how ACAP theory is being applied in IS research and in what ways it is being used to explain certain organizational phenomena. In stage one, the hypotheses collected are analyzed at the individual hypothesis level. In stage two, hypotheses are then cross-tabulated with “technical domains” to highlight where in IS research ACAP is applied and what level of support there is for the hypotheses given.

At the hypothesis level, analysis was conducted by (1) analyzing the research model of the papers, (2) deriving the hypotheses, (3) ascertaining the dependent variables (DV), independent variables (IV), and any mediating variable studied, (4) locating ACAP in the hypothesis, and (5) recording and tabulating the associated results from the study. From the sample papers reviewed, a total of 70 hypotheses relating to ACAP were identified. Figure 5 indicates that in 49 out of the 70 hypotheses (70%), ACAP is cast as the IV in the research model studied; that is, the researcher was interested in investigating the influence of ACAP on phenomena relating to IS.

	Count of Hypotheses	Hypothesis is:		Total	%
	ACAP is cast as:	Supported	No Evidence of Support		
	IV	35	14	49	70%
	DV	9	5	14	20%
	IV & DV	4		4	6%
	MED	3		3	4%
	<b>Total</b>	<b>51</b>	<b>19</b>	<b>70</b>	<b>100%</b>
	<b>Percentage</b>	<b>73%</b>	<b>27%</b>	<b>100%</b>	

**Figure 5. Summary of Hypotheses Collected from ACAP in IS Research Papers**

The data in Figure 5 also show that among the hypotheses collected, 20% cast ACAP as the DV in the research model. While these were more likely to be supported than not, the proportion of supported hypotheses among those in which ACAP was cast as the DV in the research model (9 out of 14 or 64%) is lower than those in which ACAP was cast as the IV (35 out of 49 or 71%). This may indicate that, among the sample, researchers are more interested in studying the effect of ACAP on IS-related phenomena than the effect of IS on organizational ACAP. A small proportion of hypotheses cast ACAP as both the IV and the DV, as was evident in the research models that attempted to operationalize aspects of Zahra and George (2002) by aiming to analyze the relationship between PACAP and RACAP. For example, Joshi et al. (2010) investigate the impact of IT on firm innovation and Park et al. (2007) examine how the

components of ACAP interact by investigating the user's ability to "recognize the value" of information and how that would influence the usage or "assimilation" of ERP systems in a Korean context. Moreover, it was noted that a smaller proportion of hypotheses (4%) cast ACAP as a mediating factor. This was evident in Pavlou and El Sawy (2006) who suggest that "IT leveraging competence" positively influences "dynamic capabilities (including ACAP)," which, in turn, positively influence "functional competencies." It was also evident in Francalanci and Morabito (2008) who suggest that "IS integration" positively influences ACAP, which positively influences "business performance."

In stage two, three separate analyses of ACAP hypotheses, cross-tabulated with the "technical domain" of the associated paper, were conducted. Figure 6 shows a similar pattern to that seen previously in the domain analysis of ACAP in IS research at the paper level in the sense that the most prevalent domains identified among ACAP-related hypotheses were from papers classified as "Knowledge Management/KMS/Collaborative Technology" and "ERP/Enterprise Systems/Platforms" domains respectively. Notably, hypotheses related to the "IT Governance/Organization" domain were more likely to cast ACAP as the DV in the research model, suggesting that the researchers were interested in investigating the effect of IS phenomena (IV) on organizational ACAP (DV).

Closer inspection of those hypotheses reveals that, while the research is published in respected IS journals, the IVs in these instances are not core IS issues; instead, they are predominantly organizational or environmental factors including, but not limited to, "change disposition" or "hostility in external environment." These variables do not specifically represent a significant IS technology or body of knowledge, rather, they are organizational factors that may interact with some aspect of an IS. Similar patterns can also be observed in the supported hypotheses and their associated "technical domains." When considering non-supported hypotheses and their associated "technical domains," it is interesting to note that the most prevalent domain in the sample is "IT Governance/Organization."

Count of Hypotheses - ACAP in IS Research Articles	ACAP is cast as:												Total			%		
	IV			DV			IV & DV			MED								
	Technical Domain	Supported	No Evidence of Support	Total	Supported	No Evidence of Support	Total	Supported	No Evidence of Support	Total	Supported	No Evidence of Support	Total	Supported	No Evidence of Support	Total	Supported	No Evidence of Support
Knowledge Management / KMS / Collaborative	9	1	10	3	2	5	1		1	2		2	15	3	18	29%	16%	26%
ERP / Enterprise Systems / Platforms	8	5	13				3		3	1		1	12	5	17	24%	26%	24%
IT Governance / Organization	1	3	4	4	3	7							5	6	11	10%	32%	16%
DW / BI / DSS / CRM	9		9										9	0	9	18%	0%	13%
Software Development	3	3	6										3	3	6	6%	16%	9%
B2B / E-commerce / Internet	3	2	5										3	2	5	6%	11%	7%
Other	2		2	2		2							4	0	4	8%	0%	6%
Total	35	14	49	9	5	14	4	0	4	3	0	3	51	19	70	100%	100%	100%
Percentage	69%	74%	70%	18%	26%	20%	8%	0%	6%	6%	0%	4%	100%	100%	100%			

**Figure 6. Analysis of Hypotheses Collected from ACAP in IS Research Papers Cross-Tabulated with the Technical Domain of the Source Paper for the Hypotheses**

Further analysis incorporating the behavioral domain of papers was conducted to illustrate the types of activity that involve ACAP within the supported hypotheses (see Figure 7). Among the supported hypotheses, the most prevalent behaviors are "Knowledge Transfer/Sharing/Creation" (29%) and "Utilization" (25%), with ACAP cast predominantly as the IV in both cases. The casting of ACAP as the DV is most prevalent in the collection of minority or "Other" behaviors, including "Innovation" and "Offshoring/Outsourcing."

Count of SUPPORTED Hypotheses - ACAP in IS Research		ACAP is cast as:				Total	%
Behavioral Domain	Technical Domain	IV	DV	IV & DV	MED		
Knowledge Transfer / Sharing / Creation	Knowledge Management / KMS / Collaborative Technology	6	1			7	14%
	ERP / Enterprise Systems / Platforms	4				4	8%
	Software Development	2				2	4%
	B2B / E-commerce / Internet	2				2	4%
Knowledge Transfer / Sharing / Creation Total		14	1			15	29%
Utilization	ERP / Enterprise Systems / Platforms	4		3		7	14%
	IT Governance / Organization	1	1			2	4%
	DW / BI / DSS / CRM	2				2	4%
	Software Development	1				1	2%
	B2B / E-commerce / Internet	1				1	2%
Utilization Total		9	1	3		13	25%
Adoption / Implementation / Integration	Other	2	2			4	8%
	DW / BI / DSS / CRM	3				3	6%
	ERP / Enterprise Systems / Platforms				1	1	2%
Adoption / Implementation / Integration Total		5	2		1	8	16%
Other (Including Innovation and Offshoring / Outsourcing)	DW / BI / DSS / CRM	4				4	8%
	IT Governance / Organization		3			3	6%
	Knowledge Management / KMS / Collaborative Technology	3	2	1	2	8	16%
Other Total		7	5	1	2	15	29%
Total		35	9	4	3	51	100%
Percentage		69%	18%	8%	6%	100%	

**Figure 7. Analysis of Supported Hypotheses Collected from ACAP in IS Research Papers Cross-Tabulated with the Technical Domain of the Source Paper for the Hypotheses**

### Analysis of Measures

By collecting and analyzing the measurement instruments used in the ACAP in IS research papers, it is possible to gain an understanding of how ACAP is measured in practice and to evaluate the consistency between the conceptualization and the operationalization of the theory. Of the sample papers reviewed, 74% (29) include some form of instrument to measure ACAP, such as a survey or interview questions—nearly a third of which cite Szulanski (1996) as the source of the instrument (solely or in conjunction with other sources). Xu and Ma (2008), for example, use Szulanski (1996) to measure the knowledge transferred in ERP implementation, giving the impression that ACAP is a knowledge asset (thus aligning with Cohen and Levinthal's 1990 view of ACAP as path dependent and reliant upon prior knowledge).

At the measurement level, 171 measurement instruments were located and recorded. Figure 8 summarizes the source of the ACAP instruments collected and cross-tabulated with the aspect of interest for the instrument. Of the collected measurement instruments with multiple sources (29% of the sample, 49 in all), 31 were partly sourced from Cohen and Levinthal (1990). Of these 31, 15 were sourced in conjunction with other sources outside of this review and 16 were sourced in conjunction with Boynton et al. (1994). A further seven were jointly sourced from Szulanski (1996) and Tiwana and McLean (2005), thus indicating that there is, in general, a preference among the papers reviewed for the measurement instruments provided by Szulanski (1996), and Cohen and Levinthal (1990). The instruments that have been solely sourced from Szulanski (1996) account for 18% (31) of instruments collected (this is increased to 22% when the instruments from multiple sources, including Szulanski (1996), are considered).

Figure 8 also illustrates that nearly 60% of the instruments captured from ACAP in IS research papers in this review are “indirect instruments.” That is, instead of alluding to the measurement of one of the previously recognized components of ACAP (such as “recognizing the value,” “assimilation”), these instruments allude to the measurement of antecedents (predictors) or outcomes of ACAP. This could explain the small proportion of hypotheses that cast ACAP as the DV in the research models reviewed. The measurement of DVs in ACAP research models should be focused on the real or “direct” components of ACAP, instead of its antecedents or outcomes in order to minimize the likelihood of a misalignment between the conceptualization and the operationalization.

Measure Distribution	What aspect of ACAP is the question attempting to measure?				Total	%
Measurement Source Author	Antecedent	Component	Outcome	Unclear		
Multi	27	20	2		49	29%
Szulanski (1996)	25	5	1		31	18%
Other	14	7	2	1	24	14%
Park, Suh, and Yang (2007)	5	13			18	11%
Pavlou and El Sawy (2006)	1	8	1		10	6%
Zahra and George (2002)		8	2		10	6%
Malhotra, Gosain, and El Sawy (2005)			8		8	5%
Fosfuri and Tribó (2008)	7				7	4%
Boynton, Zmud, and Jacobs (1994)	2	3			5	3%
Tiwana and McLean (2005)	2	1			3	2%
Cohen and Levinthal (1990)		3			3	2%
Mishra, Konana, and Barua (2007)				3	3	2%
<b>Total</b>	<b>83</b>	<b>68</b>	<b>16</b>	<b>4</b>	<b>171</b>	<b>100%</b>
<b>Percent</b>	<b>49%</b>	<b>40%</b>	<b>9%</b>	<b>2%</b>	<b>100%</b>	

**Figure 8. Analysis of Measurement Instruments Collected from ACAP in IS Research Papers Cross-Tabulated with the Source Paper for the Hypotheses**

Figure 9 reflects the implied conceptualization of the measurement instruments collected in relation to the aspect of ACAP they intend to measure. The “capability” conceptualization of ACAP appears to be the dominant instrument structure (64% or 109) among the measurement instruments collected, implying that the operationalizing of ACAP with regard to those instruments is generally viewed “as intended” by most researchers studying ACAP. Interestingly, “asset”-based conceptualizations of measurement instruments are highly prevalent (97%; 45 “antecedent” and 13 “outcome” from a total of 60) among the indirect aspects of ACAP. This is in contrast to “capability”-based conceptualizations, which are most prevalent among “components” of ACAP (60%; 65 out of 109).

Number of Measures	What aspect of ACAP is the question attempting to measure?				Total	%
Measure Conceptualization Implication: Asset or Capability	Antecedent	Component	Outcome	Unclear		
Capability	38	65	3	3	109	64%
Asset	45	2	13		60	35%
Unclear		1		1	2	1%
<b>Total</b>	<b>83</b>	<b>68</b>	<b>16</b>	<b>4</b>	<b>171</b>	<b>100%</b>
<b>Percentage</b>	<b>49%</b>	<b>40%</b>	<b>9%</b>	<b>2%</b>	<b>100%</b>	

**Figure 9. Analysis of the Implied Conceptualization of Measurement Instruments Collected from ACAP in IS Research Papers Cross-Tabulated with the Aspect of ACAP the Instrument is Attempting to Measure**

## Conclusions and Implications

This study demonstrates that ACAP is a significant theory in IS research and highlights some interesting phenomena for ACAP use. Four separate analyses have been conducted on IS research papers ranked as A\* and A by ACPHIS between 1990 and 2013 that apply ACAP theory. Overall, the research indicates that:

- The most prevalent technical domains associated with the use of ACAP in IS research were “Knowledge Management/KMS/Collaborative Technology” and “ERP/Enterprise Systems/Platforms.” Given that the subject theory matter is closely related to knowledge management and organizational learning, this was to be expected.



- The most prevalent behavioral domains associated with the use of ACAP in IS research were “Knowledge Transfer/Sharing/Creation,” “Utilization” (of IS), and “Adoption/Implementation/Integration.”
- At the hypothesis UoA level, 70% of hypotheses cast ACAP as an IV and only 20% cast ACAP as a DV.
- The technical domains and behavioral domains mentioned dominate the number of hypotheses. The rate of ACAP cast as IV among the supported hypotheses is significant (approximately 69%), while the rate of ACAP cast as DV among the supported hypotheses is quite low (about 18%).
- The “DW/BI/DSS/CRM” technical domain received only moderate attention in terms of numbers of ACAP-related hypotheses cast. Given the reliance on knowledge and information in decision-making routines, this is an unexpected outcome.
- At the measurement level, nearly half of the measurement questions recorded were designed to measure antecedents of ACAP, while 40% were designed to measure ACAP components.
- Approximately 65% of the measurement questions collected appear to be derived from a “capability” conceptualization, while 35% of the measurement questions collected appear to be derived from an “asset” conceptualization of ACAP.

The study has shown that there are a broad range of applications for ACAP in IS research. ACAP is predominantly used to explain IS adoption, implementation, or usage behaviors, specifically within the knowledge management and enterprise systems technical domains. However, the research shows only moderate evidence of research into the association of ACAP with the BI technical domain of IS research.

More significantly, the findings of this paper offer some important implications for IS researchers. The analysis has shown that researchers in the IS field concur that ACAP should be conceptualized as an organizational “capability,” as distinct to an “asset.” One challenge for researchers is to be able to effectively operationalize the constructs in a manner that is not contradictory to the intent of the theory. Inconsistency in the operationalization of the construct represents serious measurement validity issues that could threaten the legitimacy of the theory and it is therefore important for researchers to understand the difference between ACAP conceptualizations. It can be shown that the “capability” conceptualization takes into account the path dependency aspect of “prior knowledge” (Cohen and Levinthal, 1990), as well as the component processes required to generate exploitable knowledge in the organization. The “asset” conceptualization of ACAP, on the other hand, does not consider the “identification,” “assimilation,” “transformation,” and “application” of valuable new knowledge. Nevertheless, the complete definition put forward by Cohen and Levinthal (1990) suggests that these aspects are necessary and, hence, ACAP should be conceptualized as a “capability” and not an “asset.”

Another practical challenge for researchers is determining which aspect of ACAP to measure. Direct measurement refers to the measurement of an ACAP component such as “recognizing the value” or “assimilation.” Indirect measurement refers to the measurement of antecedents such as “prior knowledge” or “inter-organizational factors” or to the measurement of outcomes such as “competitive advantage” or “innovation.” The decision of which approach of measurement to adopt should be dictated by the corresponding use of ACAP conceptualization as an “asset” or an organizational “capability.” This paper has also identified a need to address the measurement of ACAP: researchers should carry out extensive study on measurement and conceptualization and on the development of appropriate measures. Researchers may want to consider how to conceptualize and develop a rudimentary index for ACAP that allows for direct comparisons between organizations and among industries.

A further issue observed in this research is that only a few papers investigated the impact of IS on organizational ACAP—that is, there were only a small number of papers in which ACAP was the DV. Instead, this paper reveals a strong preference among researchers for highlighting the impact of ACAP (as IV) on IS-related organizational phenomena; for example, the level of knowledge transferred in an ERP implementation (Liu et al., 2011). Specifically, there appears to be only a moderate degree of investigation of the effects of business intelligence on organizational ACAP. In the current climate, there would be significant interest in an investigation of how and if BI system usage influences organizational ACAP and how that, in turn, influences the “competitive advantage” of the organization. Future research may want



to address the question: “What transformative impact does BI systems usage and its influence on ACAP have on the organization’s attainment of competitive advantage?”

This research contributes to the body of knowledge in three ways. First, this paper has provided a tabular synthesis of ACAP model components in order to achieve a better organization, understanding, comparison, and analysis of ACAP theory and its evolution. It is possible that this tabular approach could be applied to research areas in other disciplines. Second, this research has provided a comprehensive and contemporary review of ACAP usage in IS research papers sourced from top-ranked academic journals from the inception of the theory in 1990 through to 2013. More importantly, the synthesis provided complements Roberts et al.’s 2012 analysis and thus adds to the body of knowledge of ACAP study in IS research. Third, this research has provided a method to analyze and present the application of ACAP theory to IS research by collecting and synthesizing research model hypotheses, as well as measurement instrument data, for both quantitative and qualitative analysis. In other words, this paper has made an important contribution in terms of the methodology used to conduct meta-analysis in order to contrast and combine elements of different studies utilizing the same theory.

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