

PANEL - APPLICATION AWARE IS RESEARCH: IMPACTS AND CONTRIBUTIONS

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Panelists:

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Abstract

Relevant research in Information Systems must address opportunities and problems in real application domains. An application domain consists of the people, organizational systems, and technical systems that interact to work toward the goals of a well-defined field of endeavor. The dilemma arises when the researcher attempts to generalize the results of the research beyond the application domain into broader theory. Does research rigor demand that 'good' research always result in general theory contributions beyond the application domain of the research project? What are the right research trade-offs between specific impacts to the application domain and general contributions to the IS field?

Keywords: Application domain, IS research, rigor, relevance, theory, practical impact

1. Panel Challenge

An **application domain** can drive effective IS research by presenting real-world opportunities and challenges for which current methods and technologies are inadequate. Examples of important application domains are: e-commerce; healthcare and medicine; energy and the environment; education; entertainment; science/engineering fields; and all other critical domains amenable to information systems solutions. For a specific application domain, a research project should present a clear problem statement whose objectives and challenges are not met by current systems and technologies. The research must pose a vision for achieving both domain goals and theory contributions to the field accompanied by plans to evaluate the progress and success of the new solutions. Research with the greatest impact will lead to measurable improvements in the targeted application domain.

During my recent assignment at the National Science Foundation, I had the opportunity to discuss strategic research directions with many of the thought leaders; academic and industrial; of the computer and Information science and engineering (CISE) community. The role of the application domain in research was frequently addressed. Much current research is criticized for being too unrelated to the messy realities found in complex application domains. An emerging research trend is the design and development of domain-specific system architectures, models, development methods, programming languages, and web (cloud) services. The call is for multi-disciplinary research that addresses real-world problems and provides solutions that can be demonstrated in key application domains.

The objective of this panel is to discuss the role of the application domain in top-quality IS research. The following issues will be addressed by the panel and audience:

- How important is the application domain for good IS research? How do you balance the specific (relevance) and the general (rigor) in your research?
- How do you build multi-disciplinary research teams for the application domain? How can you find industrial collaborators for your research projects?
- What application domains are currently of greatest importance and interest to the IS community?
- How do you generalize from specific application domain research to general IS theory? Is this essential in order to publish domain-specific research in top IS journals?
- Can you publish in the top journals of the application domain (e.g. healthcare) and still have the IS community recognize the visibility and value of the publication?
- How do you attract external funding to domain-specific projects? Is this an advantage or disadvantage to agencies such as the NSF and NIH?

2. Ram Gopal Position Statement

A fundamental axiom is that IT does not create value in its own right, but rather it creates the potential for derived value. This value is actualized when the information system is embedded in an application context. While this notion is generally accepted and used as a barometer to evaluate research, challenges do arise, both when a particular research has potential impacts across multiple application domains and when it when it is focused narrowly within an application setting. The evidence does point to the fact that both types of research papers are being published in the top journals. The key is ‘the strength of the contribution’ – if a research effort has multi-domain appeal then it is assessed based on the theoretical contribution, and if it is application specific then on whether it unambiguously addresses critical issues present in the domain of interest. As the extent of IT usage is increasing dramatically, it is not surprising that there is much interest in application domain specific IT research. Some visible examples of this can be found in the entertainment industry, health care, and marketing. Many of the top scholars in the field have published this type of research in both IS journals and journals dedicated to these application domains. This is very healthy for our field as it is a testament to the quality and caliber of our work, and our ability to contribute to advances in related disciplines.

3. Matthias Jarke Position Statement - Domain-Specific IT Research Rejuvenates IS Research

Information systems research was the first big success story of domain-specific ICT research, so it is strange and self-damaging for the IS field (and the business schools in general) to shy away from going a bit further, while at the same time retaining and further strengthening the core competencies developed.

On the one hand, *globalization* directs attention to cultural specifics and inter-cultural phenomena; as just one example, requirements engineering methods specifically for China are being studied, as well as information systems for areas with largely illiterate population. On the other hand, the vision of *ubiquitous* computing is getting closer and closer to reality; alongside, while RFID and related sensing technologies begin to link IS directly to the real world, they become less and less visible to end users who interact with whole environments through all kinds of devices rather than clearly visible human-computer interfaces. Taken together, both trends imply that focusing on generic IS alone sounds almost like focusing on the detection of the world formula.

In their recently defined new high-tech strategy, the German government (similar also the European Union) have thus decided to re-direct research funding on those specific industry, business and society domains where domain-specific ICT and IS solutions can strengthen existing competitive advantage or address direct societal needs; examples include embedded systems, electro-mobility, efficiency gains in healthcare management, international logistics/internet of things, and the like. While basic research funding, e.g. by the German DFG or the European ERS, has remained formally unrestricted, there is an interesting trend here coming from the researchers themselves: from the domain-specific experiences, extremely interesting new fundamental research questions for computer science and information systems emerge; they stimulate new theory solutions which often turn out to be useful beyond their initial domain. To give just a few examples: Research in RWTH Aachen University’s Excellence Cluster on Mobile Information and Communication has challenged IT security researchers to come up with novel energy-aware encryption algorithms and multiprocessor concepts such that your security will not eat up the battery of your mobile phone. Fundamental research also showed that model checking approaches from theoretical computer science generate optimal battery usage strategies in multi-battery mobiles that can double the time until reload. In larger scale IS research, simulation showed that RFID-based self-organizing agent systems where

suitcases negotiate with each other while traveling from the check-in desk to the plane, are far superior to centralized optimization methods in large airports; shouldn't such a result be of interest to organizational theory?

Summarizing, IS emerged from the confluence of business and ICT, and was in this sense the first success story of domain-specific ICT research. Adding the spice of culture-, technology-, or context-specific challenges and knowledge is not only a value in itself (drawing industry and society interest beyond the IT sector), but is also emerging as a major contributor to general knowledge in future ubiquitous and globalized information systems. Working out the implications for education, research training and publication strategies in this new world is a non-trivial task but in my opinion unavoidable.

4. Sandra Slaughter Position Statement – A One Size Development Process does not Fit All Application Domains

Software development processes include the activities, methods, practices, and transformations that are used to develop and maintain software. Decisions on software development processes include choices relating to project organization and staffing, methodologies, techniques, tools, and architecture.

Both research and practice have suggested the benefits of a “one size fits all” or “best practices” approach to software development in which a standard approach is used to develop software applications across all domains. For example, a firm could leverage a standard waterfall methodology to develop applications for all of its business units. Using one standard approach to software development can be less costly, leverage economies of scale, and simplify project management, knowledge transfer, and performance measurement (Austin and Devin 2009).

On the other hand, there are many different approaches to software development today. Further, these different approaches are often quite different and have divided research and practice. For example, flexible methodologies like agile methods compete with plan-based or more traditional waterfall approaches, and there are strong advocates for each approach.

I argue that we need to move beyond a “one size fits all” mentality in software development and move to a more nuanced view. Given the many different approaches to software development, it may not always be effective for firms to standardize on one approach across all application domains. Indeed, researchers and software development specialists have suggested the potential performance benefits of process customization (Slaughter et al., 2006). Process customization or tailoring involves adapting, particularizing, or selecting different software processes to fit the needs of different application contexts. For example, Motorola tailors software development methods to fit different industries, organizational units and projects (Fitzgerald, et al., 2003).

Although customizing processes could be more costly or complicate project management, the potential benefits of tailoring a particular software development process to fit a particular application domain could include more effective use of resources and higher quality outcomes.

There has been little research that provides evidence in terms of how and when process customizing should occur, and what is the actual value of process tailoring. Research is needed to help identify the general factors that would make software development process tailoring more or less beneficial for particular domains and to provide insight into how such tailoring should occur. Example research questions include: what software development processes are more effective for particular domains, and why? What elements of a process should be tailored, and which should not? How should a process be fit to a particular domain? What is the trade-off of process tailoring by domain versus a one-size-fits-all approach? Can different processes co-exist effectively in the same domain or project? Research to study such questions is imperative to help move toward a contingency perspective of software development.

5. Iris Vessey Position Statement

Application domain-specific approaches to IS research are traditionally based in notions of alignment, fit, or matching, with the overriding premise being that matching the solution to the problem results in strong problem-solving approaches, which, in turn, results in better outcomes than weak, or general problem-solving approaches. Such an approach requires, however, a characterization of the problem or application domain that aids the researcher in choosing an appropriate solution approach. But, how do we define “domain”? What are the aspects of a domain that are important to its solution? At what level are we seeking a problem / solution match? Is it at the nominal level of e-commerce, healthcare and medicine, entertainment, etc? Or is it intrinsically related to the nature of the problem, as in, for example, transaction processing or decision support? Or any number of other potential things?

The approach outlined above is essentially a deterministic one. However, is this realistic? As a research community we have spent enormous amounts of time on studying alignment. However, in addition to traditional views, we have seen alignment described in terms such as tinkering, bricolage, and improvisation. Does this represent a more realistic view of how we might work within a world that we cannot predict? Our world is continually changing and, at the same time, becoming more complex. How do we define an application domain in this context?

Perhaps we need new ways of thinking about these issues. In developing IS to meet the needs of our constantly changing and ever more complex world, perhaps we should turn our attention to how to develop IS that co-evolve with the environment in which they exist. Such an approach would be bottom-up or evolutionary in nature as opposed to our current top-down approach. Furthermore, it would involve notions of fit on multiple levels and across a range of disciplines. I will explore notions of complexity theory in an attempt to illustrate the potential of this approach to notions of fit or alignment, as well as exploring the role of the application domain within this context.

Time permitting; I will also share with attendees my current attempt to challenge traditional notions of generalizability which champion weak approaches.

6. Panel Schedule

The panel chair will set the stage by introducing the topic and the panel discussants. Each discussant will take 10 minutes to state their position and views on the topic. The remainder of the panel session will be a question-answer format moderated by the panel chair.

References:

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