



# Combining variance and process in information systems research: Hybrid approaches



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## ABSTRACT

For the most part, research in Information Systems has been conducted following either a process or a variance approach. Some argue that the two approaches should be kept separate because they have different underlying assumptions. Others disagree. Through problematization, we review the distinctions between process and variance approaches and examine such distinctions to show that these approaches sometimes overlap and can be combined. We then present a new set of assumptions for hybrid approaches and specifically distinguish between three types of combinations or hybrids, parallel, weakly blended, and strongly blended. We then introduce a toolbox for modeling hybrid approaches in a coherent way followed by an example on how to use the toolbox. We end the article by providing reasons for considering hybrid approaches, possible areas of research, and a set of guidelines for authors and review teams.

We do not have to accept the integrity of extant paradigms because their assumptions are always limited and, therefore, the subject of critique... Rather we need to develop new paradigms, with their own assumptions and commitments, which draw on the strengths and weaknesses of the current ones, recognizing the plurality and diversity of the world.

(Mingers, 2001, p. 243)

## 1. Introduction

Scientists use theories to help them explain what goes on in the real world. Such theories need to be thought of as abstract representations that depend on theorists' interests, not necessarily corresponding to real-world phenomena in a one-to-one way. In information systems (IS), we typically construe these phenomena using variance (e.g., Davis, 1989) or process (e.g., Lapointe & Rivard, 2005) approaches (Gregor, 2006; Paré, Bourdeau, Marsans, Nach, & Shuraida, 2008; Rivard, 2014). Since the explicit distinction between process and variance by Markus and Robey (1988) was first introduced to the field, several researchers have argued for the necessity of keeping these approaches<sup>1</sup> separate (Newman & Robey, 1992; Seddon, 1997). They argue that the two approaches have different ontological assumptions, different types of causality, and different theoretical explanations. To this day, reviewers continue to point out issues when they are not kept separate; for instance, we recently received these comments on a journal submission:

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<sup>1</sup> We use the term approach as an umbrella term to encompass a way of dealing with theory, research, or both. Theory is an explanation of phenomena whereas research can be thought of as an empirical study of phenomena and can encompass theory as well.

*I am struck by ... the apparent disconnect between your framing of the current study as a 'process' theory and some of the presentation and structure as a 'variance' theory. Perhaps it is not either/or ... however, the danger with such a hybrid approach is that it comes across as a weaker alternative than the predominant or alternative paradigms ... The paper comes across as a little bit schizophrenic and creates confusion in the mind of the reader about what you are actually trying to accomplish.*

At the same time, others propose that separating variance and process approaches can have detrimental effects: it unnecessarily limits the variety of theories constructed and research conducted (Langley, 1999). Thus, some have called for a combination of the two approaches (e.g., Burton-Jones, McLean, & Monod, 2015; Sabherwal & Robey, 1995). These researchers argue that social phenomena are intertwined and that variance and process models should be combined to better explain these phenomena (e.g., Langley, 1999; Peterson, 1998). They argue that the best theories are often hybrids that combine variance and process theorizing (DiMaggio, 1995).

In this paper, we argue that the distinctions between the two approaches are more artificial than a real reflection of research practices in our field, and demonstrate how they already overlap to some extent in our theorizing and empirical research. Further, we propose that even more overlap should be encouraged because hybrid approaches are in a privileged position to address some of the toughest research questions of our field. However, one of the challenges in doing so concerns representing hybrids in coherent ways: instead, we often use the same symbols (such as arrows) to represent different things in process and variance models, causing confusion (Seddon, 1997). Thus, we develop and illustrate the use of a 'toolbox' to present hybrid models.

Before doing so, however, it is important to acknowledge two facts. First, each approach, variance and process, has made substantial contributions to the IS discipline. This paper's objective is not to undermine any of these approaches or their contributions. For example, variance approaches have helped greatly in identifying the factors influencing the acceptance of IS by users in organizations (e.g., Davis, 1989). Likewise, process approaches, although less common (Paré et al., 2008), have provided theoretically sound and empirically grounded explanations of how resistance to IS develops longitudinally in a bottom-up process involving individuals and groups (e.g., Lapointe & Rivard, 2005) or how socio-technical systems change both incrementally and in a punctuated way across different levels (e.g., Lyytinen & Newman, 2008). Thus, each approach has complemented the other and helped greatly in building rigorous cumulative scientific knowledge about the many different topics that make up the IS discipline.

Second, our paper builds upon others who have called for more hybrid theorizing (Burton-Jones et al., 2015). For example, Burton-Jones et al. (2015) suggest several ways of combining process and variance approaches, such as variables being affected by events and events being affected by variables. We go beyond this by first, introducing a new set of assumptions regarding hybrids, second, providing a flexible toolbox for building hybrid models, and third, proposing research ideas that can be best addressed from a hybrid approach.

We develop the paper through problematization (Alvesson & Sandberg, 2011). Problematization, or the active challenging of assumptions (Alvesson & Sandberg, 2011), is a powerful motivation for theoretical development (Rivard, 2014). In doing so, we provide a succinct review of past assumptions underlying typical process and variance distinctions. We then show that much of IS research already demonstrates elements of both, suggesting that researchers value hybrid approaches rather than always keeping them separate. Third, we distinguish between three types of combinations, parallel, weakly blended, and strongly blended, and then present a toolbox that can enable hybrid modeling, demonstrating how hybrid approaches can be carried out. Finally, we provide arguments for why more hybrid approaches should be adopted, discuss important research ideas for the IS field that can be addressed with a hybrid approach, and suggest how editorial review teams can become more developmental in their assessments of hybrid approaches.

## 2. Variance, process, and hybrid approaches

In order to better explain the differences between process and variance approaches, we initially present sharp contrasts between them, but then argue that both approaches are more similar than first thought. We do not have the objective to set up such differences as 'straw men' arguments, but to help in the comprehension of the characteristics of each approach in the way that such characteristics have often been explained and portrayed in the past (Mohr, 1982). By pitting variance and process against each other, we do not imply that all researchers in IS concur with the differences originally portrayed by Mohr. Instead, we want to bring attention to three issues. First, we believe that we have put too much reliance on Mohr's (1982) earlier work, when in fact there is confusion in his arguments (Shaw & Jarvenpaa, 1997), which he has since acknowledged (Mohr, 1996). Second, most IS papers do not enter into discussions of whether differences between the two approaches make sense (e.g., Gregor, 2006; Paré et al., 2008). Third, in the rare occasions in which this issue is explicitly discussed, one opinion is that variance and process should be kept separate (e.g., Newman & Robey, 1992; Seddon, 1997), although more recently others have suggested they be combined (e.g., Burton-Jones et al., 2015). We concur with this latter perspective and explain why hybrid approaches are sometimes appropriate.

Before continuing, it is important to note that there is much diversity and variations within each approach, especially within process approaches. Whereas variance approaches are generally positivist, process approaches can be built with different strategies such as grounded theory, visual mapping, and narratives (Langley, 1999) and may be positivist or interpretivist (Dubé & Paré, 2003). Along a similar vein, it is important to note that some would argue that systems dynamics is a process approach, while others have categorized it as a third approach, independent of variance and process (Burton-Jones et al., 2015).<sup>2</sup> Thus, it should be noted that our portrayals of process

<sup>2</sup> Although Burton-Jones et al. (2015) suggest that hybrid approaches are suitable for interpretive research, we will later propose that hybrid approaches are more appropriate for positivist research.

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