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Information Technology and organizational innovation: Harmonious information technology affordance and courage-based actualization

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ABSTRACT

Researchers and practitioners have long believed that information technology (IT) is a key tool for fostering innovation. However, there is a certain inconsistency in the literature, which makes it challenging for researchers to figure out exactly how and why IT plays such a pivotal, strategic organizational role. The motivation for this research is the multiple contradictory results reported by studies investigating the influence of information technology (IT) on organizational innovation. This study utilizes a fit-based perspective in an attempt to disentangle these contradictions. Using Venkatraman's (1989) seminal paper on fit, we conceive of two critical fit-based concepts: *harmonious IT affordance in an organization* (HITA) and a subsequent fit between HITA and organizational courage. HITA reflects a covariance fit (coalignment) between the three major IT affordances in an organization—collaborative affordance, organizational memory affordance, and process management affordance. Organizational courage reflects the boldness (risk-taking ability) of the organization. Finally, HITA and organizational courage represent a matching fit (reflected as actualized HITA) that influences two kinds of innovation: exploratory and exploitative. Two studies, conducted in the US and Chinese contexts, provide support for this theory. The main contribution of the paper is in showing that IT can lead to innovation if (a) organizational IT affordances harmoniously coalign (as HITA); (b) and, organizational courage acts as a powerful contingency that actualizes HITA, and this actualized HITA influences innovation.

Introduction: IT and innovation

Researchers strongly agree that innovation is crucial to achieving and maintaining sustainable competitive advantage in an organization (e.g., Bartel and Garud, 2009). *Innovation* is the development or implementation of new or altered products or services that create new value for an organization's stakeholders (Joshi et al., 2010). Innovation is, therefore, believed to be a crucial aspect of strategic organizations that thrive (e.g., Oke et al., 2012; Taran et al., 2015). In this age of rapidly changing information technology (IT), the need to study organizational innovation (*innovation and organizational innovation are used* interchangeably in this article) has never been greater (Lusch and Nambisan, 2015) and scholars regard innovation among the vital concepts involved in studying the

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role of IT in organizations (Fichman et al., 2014; Kleis et al., 2014).

Increasingly, the IT-based organizational innovation literature proposes that a *contingency-based* view is crucial to understanding innovation (Oh and Pinsonneault, 2007; Singh et al., 2015; Vessey and Ward, 2013; Wu et al., 2015); this view explains that a good "fit" between IT and organizational factors results in innovation (Chen et al., 2010; Roberts and Grover, 2012; Tallon and Pinsonneault, 2011). In this view, "IT resources…may [by themselves] add little value and play a major role in improving a firm's performance only when they are planned and used to support a firm's main strategic objectives" (Oh and Pinsonneault, 2007, p. 240). The concept of fit is synonymous with the concepts of *alignment* and *harmony* (Chan and Reich, 2007). Advocates of the notion of fit posit that when the IT infrastructure of an organization converges with its goals, attributes, and activities, fruitful innovation takes place (McKeen and Smith, 2003). Not surprisingly, the quest continues—especially in the IT alignment literature—for investigations into better alignment between IT infrastructure and organizational attributes leading to innovation and sustained competitive advantage (Tanriverdi et al., 2010).

Despite the increasing amount of research on IT-enabled innovation and the evidence that IT can provide a means for developing better products and services, the literature remains circumspect regarding the role of IT in organizational innovation. Researchers are often frustrated in their quest to fully understand the link between IT and innovation; in fact, several recent studies question whether there is an unequivocal link (e.g., Chae et al., 2014; Fink, 2011; Kleis et al., 2012). A fairly recent study makes the surprising claim that although IT influenced organizational innovation in the 1990s, it has not done so in the 2000s (Chae et al., 2014). Research in this area has in general reported mixed outcomes about the relationship between IT and innovation, including a finding of no direct link between IT and organizational innovation in some circumstances (Joshi et al., 2010).[1]

Such counter-intuitive findings result in a fragmented understanding of IT-enabled innovation and have led to explorations of alternative theoretical lenses to study innovation. For example, the lens of agility has been considered as playing an important part in this relationship (Ravichandran, 2018). Other research has considered the resource orchestration perspective (Cui et al., 2017). A series of studies on IT and innovation that leverage the dynamic capabilities approach have used the resource-based view of the firm (e.g., Pavlou and El Sawy, 2006; Pavlou and El Sawy, 2011). Our research follows this line of thought but focuses on two key ideas that, we feel, have received inadequate treatment in the literature on IT and innovation: *fit* and *organizational courage*. Although innovation research often focuses on fit (alignment) between IT and business (Yeow et al., 2018), we propose a novel understanding of fit at multiple levels. The first level concerns the fit between the varying facets of organizational IT—captured by what we define later as the coalignment between multiple organizational IT affordances. IT affordances fundamentally capture the action potential of IT in an organization, and can be understood as what the IT allows the human users to do (Markus and Silver, 2008; Yoo, 2010). Our conceptualization of fit combines the various IT affordances in an organization and reflects the overall harmony among these multiple IT affordances, which we name *harmonious IT affordance* (i.e., HITA). HITA represents an action potential and needs to be *actualized* (effectively used) for concrete outcomes to occur within an organization (Burton-Jones and Volkoff, 2017). As an actualization mechanism, we propose a second level of fit between HITA and organizational courage. This higher level of fit represents the mechanism of actualization of HITA (i.e., realization of the action potential of HITA) by organizational courage; we believe that this is crucial to innovation. We assert that the addition of these new fit perspectives, and the use of organizational courage as a key actualizer of HITA to produce innovation will be a substantial addition to the literature. Accordingly, we address the following research question:

RQ: Does a fit between organizational courage and organizational harmonious IT affordance—understood as an actualization of the organizational harmonious IT affordance—foster innovation?

Next, we discuss the primary reasons for considering fit and organizational courage for investigating organizational innovation. This discussion elaborates on the primary motivation of our paper. Following that, we develop our conceptual background in which we discuss the two forms of innovation (exploratory and exploitative), the concept of organizational IT affordances, and how multiple IT affordances can be synergistically coaligned into HITA. We then propose our hypotheses on how a combination of organizational courage and HITA (conceptualized as actualized HITA) influences innovation, how this effect is different based upon the two forms of innovation, and how these two innovation forms may be related. Next, we present our empirical investigation and discuss the results. We conclude with contributions and implications for future research and practice.

Addressing two pivotal considerations in innovation

We first propose that to move the literature on IT and innovation forward, two key concepts crucial to innovation need to be richly addressed and infused into the literature: *fit* (Venkatraman, 1989) and *organizational courage* (Chatterjee et al., 2015).

Fit: A crucial but underutilized concept in innovation research

The concept of fit posits that some degree of alignment between multiple factors is necessary to produce outcomes (Venkatraman,

[1] Summarizing this sentiment at the *Hawaii International Conference on System Sciences* 2017, Dr. Kalle Lyytinen, speaking on the panel on "40 years of IS research" highlighted that IT has not been linked to productivity gains at the national and international levels in the period 2005–2015. Although innovation is not the same as productivity, they often have a close connection, and this observation generates further circumspection regarding the role of IT in innovation.

Table 1
Different types of fit (Venkatraman 1989).

Fit type	Description	Generalized functional form and analytic approach	# of variables
Moderation	This perspective sees fit as a moderating effect where the impact of the predictor variable on a criterion variable is expected to be contingent upon a third variable.	Y = f (X, Z, X.Z), where Y is the criterion variable, X is the predictor variable, Z is the contextual variable, and X.Z represents the joint effect of X, Z on Y (i.e., the fit). Can be analyzed using (a) analysis of variance, (b) moderated regression analysis, and (c) sub-group analysis	Two
Mediation	This perspective sees fit as an intervening effect between two variables with presumed relational precedence. It implies the existence of a transitive effect.	Z = f(X) and Y = f(Z) There is an implied need for the presence of Z for the transmission of any effect of X on Y. Mediational fit is analyzed through path analysis.	Two
Profile deviation	This perspective sees fit as the degree of adherence to an ideal profile.	Analytically, this fit is explored as the deviation from a Euclidean distance in an n-dimensional space.	Multiple
Matching	Here, fit is defined as a match between a certain level of a variable to a certain level of another variable. For example, variables X and Y could match at various levels such as HI–HI, HI–LO etc. Typically, a subset of the possible set of matches would be related to a positive theoretical outcome.	Analytically, this match is conceptualized as (a) the absolute difference between the standardized scores of two variables and (b) the residuals from the regression of one variable (X) to another (Z). These residuals could be related to the criterion variable (Y) and (c) through an examination of similarities in levels of different variable.	Two
Covariance	Fit in this perspective represents covariance or internal consistency within a set of theoretically relevant constructs. This is also termed as coalignment	Analytically, covariance fit is captured through factor analysis, where different dimensions contribute to an overall factor structure.	Multiple
Gestalt	This is a multivariate perspective, which identifies gestalts that can be defined in terms of "a degree of internal coherence" (Venkatraman, 1989, p. 142).	Gestalts are analyzed though numerical taxonomical methods such as cluster analysis and q-factor analysis. In the former approach, a gestalt fit is identified by examining the coherence between cluster attributes and the theoretical nature of the cluster.	Multiple

1989). Within the scope of IS research on innovation, this fit would be one between organizational IT and other organizational factors (Oh and Pinsonneault, 2007).

There are multiple rationales behind the choice of using fit as a theoretical vehicle to study innovation. First, fit represents a well-established conceptual element for examining a multivariate organizational environment, that is, an organizational environment where the interplay and convergence of multiple factors are crucial to understand organizational outcomes. Essentially, fit represents how aligned multiple factors in an organization are, such that they can work together to produce outcomes. Existing research in both IS and strategic management have used fit to examine innovation (Baker et al., 2011; Keller, 1994; Kim et al., 2013; Volberda et al., 2012; Wu, 2015), and have demonstrated that fit can be seen as a driver of innovation and performance.

Second, fit is a versatile concept that can be conceived of in multiple ways, such as mediation, moderation, match, covariance, profile, and gestalt (Venkatraman, 1989). Table 1 summarizes the different types of fit. Our study leverages two of these types of fit: We capture HITA using fit as covariance (F1) and the actualization of HITA to produce innovation using matching fit (F2).[2]

It is notable that although studies increasingly call for better understanding of the alignment/fit between information technology and organizational factors (Tallon and Pinsonneault, 2011), few have explored the varying nuances of fit. For example, the notion of strategic IS alignment, representing a fit between IS strategy and business strategy, often conceptualizes this fit in terms of mediation (e.g., Wu et al., 2015) or moderation (e.g., Cragg et al., 2002). In fact, mediation and moderation have been among the most common conceptions of fit/alignment used in IS research on strategy and innovation (Coltman et al., 2015). Although a consensus is emerging on the usefulness of the fit/alignment perspective in IS research, it is increasingly clear that most studies discussing the role of IT in innovation do not delve deeply into alternate and varying operationalizations of this fit.[3] Our examination of covariance and matching fit *extends the spectrum* of how the literature operationalizes fit. Also, by conceiving fit as occurring at multiple levels (fit between HITA—itself a fit—and organizational courage), we are able to examine the contingent nature of innovation in more granular ways. Consequently, we claim that the study goes beyond a possibly *myopic* view of fit (i.e., understanding of fit simply as mediation or moderation or not investigating whether fit can occur at multiple levels) in understanding the IT-innovation relationship.

[2] Please note that innovation is not the actualization of HITA; rather innovation is the effect of the actualization of HITA.
[3] As an example, one of the seminal papers on fit (Venkatraman, 1989) has been cited only about 40 times in the IT literature and innovation.

Organizational courage: A virtue crucial to innovation

Research on organizational innovation does not often factor in one essential prerequisite of innovation: the notion of *organizational courage*. The salience of courage in this context arises from the fact that it is a key aspect of human agency in organizations. *Human agency* fundamentally underpins technology-based outcomes in organizations and can be defined "as an open-ended, reflexive, purposive, and generative propensity [by humans] to seek transformation and meaning" (Carlsen, 2006, p. 133). Organizational-level outcomes depend upon how well organizational members identify with a shared agenda, focus, and purpose—creating what is known as *collective agency* (Fiol and Romanelli, 2012); thus, any discussion of IT-enabled innovation is incomplete without understanding the collective agency that fuels this innovation.

One of the most powerful ways to envision and capture the notion of human agency is through the lens of virtue ethics (Aristotle, 1985, reprinted). In his book, *Nichomachean Ethics*, Aristotle argues that an agent possessing certain virtues can reflect upon, and cognitively select actions that are good and desired. Therefore, arguably, virtues epitomize a very powerful form of human agency, especially relevant in the decisional quagmire of the corporate environment.

Virtues are defined and nurtured within a community of practice and are instrumental to the pursuit of excellence within that community (Sadler-Smith, 2012). Formally, *virtues* can be defined as acquired qualities, "the possession and exercise of which tends to enable us to achieve those goods which are internal to [a community of] practices and the lack of which effectively prevents us from achieving such goods" (MacIntyre, 1985, p. 191). Research posits that, apart from individuals, organizations can also acquire virtues (Chun, 2005), because they represent communities of practice (Chatterjee et al., 2015). Specifically, Barnard (1938) argues that virtues define the nature and purpose of an organization. This notion is supported by Moore and Beadle (2006), who note the relevance of institutionalizing such virtues and their enabling conditions, such as virtuous employees and institutional processes that support virtues. Specifically, organizational virtues express what organizations "aspire to be when they are at their very best" (Cameron et al., 2004, p. 767). Unsurprisingly, virtues are thus assumed to be crucial to an organization's pursuit of excellence (Weaver, 2006) and are found to be critical to outcomes such as "profitability, productivity, *innovation*, quality, customer retention, and employee loyalty" [emphasis added] (Caza et al., 2004, p. 174). In summary, organizational virtues represent a potent form of collective human agency exhibited by the organization (Bright et al., 2014; Nilsson, 2015).

Studies drawing on Aristotelian virtue ethics (Aristotle, 1985) identify organizational courage as a key virtue of competitive and innovative organizations (Chatterjee et al., 2015; Koerner, 2014; Schilpzand et al., 2015). The virtue of *courage* is primarily defined as boldness or risk-taking (Janz and Prasarnphanich, 2003; Solomon, 1992) and implies taking risks to serve greater interests, such as organizational innovation and success, and therefore is at the "heart of…*innovative*…endeavors…" [emphasis added] (Koerner, 2014, p. 65). It has been claimed that cultivating courage in organizations "will finally break the *major barrier* to…innovation" [emphasis added] (Perel, 2002, p. 17). This shows that organizational courage is a *primal* form of collective human agency to be considered in innovation contexts,[4] primarily because it encapsulates intentionality, cognition, and deliberate and calculated risk-taking and action (Koerner, 2014)—all of which are foundational to defining human agency (Bright et al., 2014).

The salience of courage to organizational innovation has often been alluded to and supported in the extant literature. Scholars note that one of the fundamental challenges to innovation is a lack of courage on the part of the organization and its senior management (Assink, 2006). Others note that "leading edge organizations consistently innovate, and do so with courage" (Ahmed, 1998, p. 38). Given that innovation often requires decision-making under pressure and a willingness to proceed in spite of the risk of failure, courage is a crucial factor (Schilpzand et al., 2015). Innovation is not possible without creativity, and creativity requires courage to go beyond the status quo (Harker, 2014). Courage becomes even more valuable in economic downturns such as the Great Recession and "offer[s] a great opportunity for courageous firms to pull ahead of competitors" by being less conservative and continuing to search for, and create, unique opportunities to innovate and strengthen their market position (Steenkamp and Fang, 2011, p. 644). An organization that is not courageous can have resources at its disposal but will likely not be able to leverage them for potentially risky endeavors such as innovation.

In fact, if an organization is courageous, it ultimately leads to the creation of new and innovative products and services (Danneels and Sethi, 2011). Not surprisingly, the value of courage to innovation has been captured using such evocative and powerful metaphors as the "Indomitable Gauls [i.e., the Gauls who resisted the Roman invasion]", with researchers noting:

> The quest for useful…[innovation] models, while far from easy, can provide significant rewards to…organizations involved. But…[they] need the **courage** and determination to begin the journey… [emphasis added] (Lilien et al., 2013, p. 244).

Given these compelling claims, we assert that the concept of fit and organizational courage are not just key factors to achieving organizational innovation, they are foundational. Although they have been consistently alluded to in the literature on IT or innovation, they have often been misunderstood, overlooked, and under-leveraged. To address this omission, we posit that organizational innovation is influenced by the fit between two important concepts*:* organizational courage and HITA (we formally define HITA later). As explained, IT affordances fundamentally capture the role of IT in organizations (Carlo et al., 2012; Gal et al., 2014; Leonardi, 2011; Markus and Silver, 2008), making them a particularly powerful lens for our study. Specifically, using multiple nuances and levels of fit involving organizational courage and organizational IT affordance, we investigate how organizational IT affordance fruitfully fits (aligns) with the construct of organizational courage—a concept which we term as *actualization of the IT*

[4] This does not mean that there are no other forms of human agency involved in innovation. However, courage certainly is an important one. We urge future research to investigate further forms of human agency necessary for innovation.

affordance—to produce innovation.

The contribution of our study—particularly in terms of the novelty of our conceptual elements—can be gauged in the context of two recent reviews of innovation research in IS (Jha and Bose, 2016; Kohli and Melville, 2019). The first work clearly outlines existing research themes and theories in this literature through a comprehensive review of 113 articles in the top 10 IS journals for the 15 years prior to 2016. Notably, both affordance theory and virtue ethics are somewhat absent from this review. Our study actually combines these theories—affordance theory allows us to develop the idea of HITA using the concept of fit, whereas virtue ethics allows us to use the conception of organizational courage. Our research thus addresses this gap in the literature, and investigates not only unique antecedents (e.g., courage) that add to the innovation literature, but also a unique way to combine them using the notion of fit.

The second comprehensive review of innovation in the IS literature (Kohli and Melville, 2019) highlights, among others, key characteristics of the organization that are crucial to innovation. Of particular relevance to our study are the following characteristics: creating an environment conducive to innovation, promoting a learning culture, and the ability to absorb new knowledge (i.e., *absorptive capacity*). These characteristics have all been subsumed within the idea of organizational courage in multiple studies (Amos and Klimoski, 2014; Hart et al., 2016; Schilpzand et al., 2015), further suggesting the usefulness of the courage construct as a versatile and parsimonious conceptual lens when studying innovation.

Conceptual background

Organizational innovation

Because our discussion revolves around how innovation can be actualized through a fit between IT and organizational courage, it is pertinent to understand the two different kinds of innovation that can occur.

Research on innovation suggests the need to focus on two different forms of innovation: exploratory and exploitative (Andriopoulos and Lewis, 2009; Gupta et al., 2006; Jansen et al., 2009; Jansen et al., 2006; Sidhu et al., 2007). *Exploratory innovation* is the development of new products and services, whereas *exploitative innovation* is the use of existing knowledge, products, and services to better serve existing customers (Jansen et al., 2006). Exploratory innovation supports the organization's viability in the long term, whereas exploitative innovation supports the organization's success in the short term (Wu, 2012). Researchers note that exploratory innovation, in which the organization departs from its existing knowledge base, is mostly *radical*, whereas exploitative innovation, which leverages an organization's existing knowledge, is more *incremental* (Rosenkopf and McGrath, 2011). Often exploratory innovations are more disruptive and discontinuous than exploitative innovations.

Organizations engaging in exploitative innovation are consistently profitable and maintain their client base; on the other hand, organizations engaging in the cutting-edge design of products and services can be considered as engaging in exploratory innovation (Andriopoulos and Lewis, 2009). In deciding whether to explore or exploit, organizations tend to pursue exploitative innovation because of its predictable, consistent, and immediate returns (Phelps, 2010). However, studies have started to link exploratory and exploitative innovation (Gupta et al., 2006), arguing that there may be a positive relationship between them, an idea developed further by our theory.[5]

IT affordance(s)

We proposed the necessity to include courage and IT affordance—operationalized through the lens of fit—to fruitfully understand innovation. This requires an elaboration and understanding of the notion of IT affordances, a key element of our conceptualization. The salience of IT to organizations is arguably best captured by the notion of IT affordances (Leonardi, 2011). The idea of affordances originated in the works of Gibson (1986; original: 1979); this was later extended into research on technology and organizations by Norman (2013; orginal: 1990). Building upon prior work, Markus and Silver (2008) emphasized that *affordances* come into existence in the relationships between human beings and physical artifacts, and are action possibilities arising from the relationships between human actors and technological artifacts. The extant organizational IS research has embraced this relational view of affordances. As Treem and Leonardi (2012, p. 46) aptly recount:

> *Today, the most nuanced writings on the relationship between technology and organizational change emphasize the relational character of affordances. In this view, affordances are not exclusively properties of people or of artifacts—they are constituted in relationships between people and the materiality [technological features] of the things with which they come in contact.*

For example, Cousins and Robey (2015) discuss mobile ICT affordances as capturing the relationship "between users' abilities and features of mobile technology" (p. 34).

The relational nature of an affordance can be formally defined as capturing "what the [IT] artifact allows humans to do" *and* represents "the possibilities for goal-oriented action afforded to specified user groups by technical objects"(Markus and Silver, 2008, p. 622). Specifically, IT affordances "constitute concrete, dynamic, and situated relations between the IT capabilities at hand and a user's goal-oriented behaviors," and different "IT capabilities provide different affordances when appropriated under different goal-

[5] In this context, we note that the emerging notion of organizational ambidexterity, which captures how well an organization balances its exploratory and exploitative innovations, is beyond the scope of our paper.

oriented actions" (Carlo et al., 2012, p. 1084).[6] IT affordances capture the interplay between IT and organizational social elements, in which the arranging and rearranging of IT within the social environment (or vice versa) continuously create possibilities for influencing the form and function of an organization.

Affordances go beyond capabilities and in fact encapsulate them. To explain how this occurs, we first briefly discuss the difference between IT capabilities and IT affordances. *IT capability* is "the possibility and/or right of the user or a user community to perform a set of actions on a computational object or process" (Carlo et al., 2012, p. 1084). Conversely, *IT affordances* are defined as "the possibilities for goal-oriented action recognized by a specified user group" (Carlo et al., 2012, p. 1084). It has been clarified that "the same IT capability can be differently appropriated in diverse contexts due to the mutability and negotiability of goal-oriented actions, thus giving rise to different affordances in different situations" (Chatterjee et al., 2015, p. 161). An apt example that clearly differentiates between IT capabilities and IT affordances is as follows:

> An actor who uses a 3-D visualization capability [an IT capability] to show the aesthetics of a building's geometry is appropriating a different IT affordance than an actor who uses the same 3-D visualization capability to improve geometric accuracy in constructing the building. Actors can always choose to appropriate different affordances of the same IT capabilities (Carlo et al., 2012, p. 1084).

Namely, IT capabilities and IT affordances share a 'one-to-many relationship.' In fact, IT affordances encapsulate IT capabilities because they capture the active appropriation of the IT capability according to human goals and abilities (Robey et al., 2013; Treem and Leonardi, 2012) and it has been noted explicitly that "IT affordances incorporate both IT capabilities and the ways in which organizations and their social structures appropriate those capabilities" (Chatterjee et al., 2015, p. 161). Therefore, discussing affordances inherently includes a discussion of capabilities, because affordances encapsulate capabilities and thus hold more fundamentality when conceptualizing the role and implications of organizational IT.

The nature and types of affordances are well-defined in the existing literature (Burton-Jones and Grange, 2013; Leonardi, 2011; Markus and Silver, 2008; Zammuto et al., 2007). Based on previous work, Chatterjee et al. (2015) identify three fundamental organizational IT affordances: organizational memory affordance, collaboration affordance, and process management affordance. *Organizational memory affordance* is the "IT-facilitated ability to create, store, transform, refine, access, mobilize, apply, and exploit organizational knowledge"; *collaborative affordance* is the "IT-facilitated ability to instill cooperation within an organization, both in a collocated and distributed/virtual setting, on a one-to-one or many-to-many basis"; and *process management affordance* is the "IT-facilitated ability to design, visualize, prioritize, and monitor work processes, as well as allocate and manage appropriate resources to enable action and decision" (Chatterjee et al., 2015, p. 165). For the purposes of the current study, these conceptualizations of IT affordances help to establish how they enable the achievement of organizational goals such as innovation.

Conceiving of a superordinate IT affordance (HITA) in an organization

Although the affordances delineated by Chatterjee et al. (2015) provide a starting point, it is important to note that their treatment of affordances was largely orthogonal. Whereas they alluded to the fact that affordances could be interdependent, their overall investigation did not focus on whether individual affordances affect each other. For example, collaborative affordance, by facilitating knowledge exchanges, may contribute to organizational memory affordance. Affordances are therefore interrelated, and can work in *tandem* (i.e., be coaligned) to promote organizational outcomes.

Further evidence suggests that IT affordances can be coaligned and they can be conceptualized as combining into a higher-order general IT affordance that reflects this coalignment (Volkoff and Strong, 2013). Conceptually, this higher-order IT affordance is essential for organizations to achieve specific goals (Burton-Jones and Grange, 2013)—in our context, the goal of innovation through IT-enabled changes.

Prior research has articulated the notion that affordances combine to produce higher-order affordances. For example, Van Leeuwen et al. (1994) elaborated that "tool use" is an affordance that combines three underlying affordances: an actor (user)-target (goal) affordance, an actor-tool affordance, and an target-tool affordance. The interdependence between these lower affordances is represented well by a higher-order affordance which effectively captures their complementarities. Supporting this notion, Wagman et al. (2016) criticized what they called the "single affordance paradigm"—that is, the obsession with individual affordances—and highlighted the need to consider multiple *subordinate* affordances that could be nested inside a *superordinate* affordance. They provide an example of such as superordinate affordance, as follows:

> *[T]he affordance of **drinkable** from has a nested structure of (component) affordances that include the affordances for **pour-in-able**, **graspable**, and **liftable**. If any of these nested affordances are not present, then the object does not afford drinking from [emphasis added] (p. 2).*

In the above example, the three subordinate affordances—pour-in-able, graspable, and liftable—combine to provide the higher-order, superordinate affordance of *drinkable*. Following this argument, we propose that our three affordances of collaboration, organizational memory, and process management are subordinate affordances that combine to create an overall superordinate IT affordance salient to innovation.

[6] It is notable that IT affordances are different from IT capabilities; please see Carlo et al. (2012) for the difference between IT capabilities and IT affordances.

The IS literature further supports our contention that individual IT affordances can be holistically bundled into a superordinate, higher-order affordance (Strong et al., 2014). Our approach is consistent with the notion of higher- and lower-level affordances (Burton-Jones and Grange, 2013), according to which lower-level affordances are fundamental to the emergence of a higher-level affordance. As Strong et al. (2014) explain, an organization can possess multiple technical artifacts that can *align* to promote organization goals. Similarly, a higher-order aligned IT affordance captures how such lower-level affordances in an organization can align to promote favorable outcomes such as innovation.

Integrating these arguments, we propose that the three subordinate affordances identified in Chatterjee et al. (2015) coalign, and can be combined into a single, superordinate, higher-order IT affordance that promotes the overall role of IT in the organization. This conception of the higher-order IT affordance builds upon the notion of coalignment between the three lower-level affordances, which work together to realize the higher-level goal of innovation (Bygstad et al., 2016). Formally, this *higher-order IT affordance* can be defined *as* an IT affordance provided by the organizational IT through a harmonious coalignment of the three lower-level affordances of collaboration, organizational memory, and process management. The notion of harmony emphasizes that the three IT affordances should coalign: they should be mutually reinforcing and combine into a synergistic higher-level affordance for innovation. Accordingly, we name the higher-order (superordinate) IT affordance as *HITA*.

The salience of HITA to organizational innovation

From an IT standpoint, innovation is an outcome of human agents using IT to enrich or create new organizational resources that help the organization create new products or services. Innovation requires that organizations take knowledge assets as inputs and produce new knowledge assets as outputs (Wu and Hu, 2012). This means that innovation is dependent on the primary functions related to acquisition, transfer, integration, and application of existing organizational assets. In an IT-enabled organization, IT is a prime asset (Bharadwaj, 2000), and the abovementioned functions (acquisition, transfer, integration, and application of existing organizational assets) are arguably dependent on the organizational IT—more specifically, on the affordances that the organizational IT provides. IT provides open and flexible affordances that can serve as drivers of innovation (Yoo et al., 2012). Because IT affordances capture how human beings use IT, it logically follows that innovation can be an outcome of IT affordances (Yoo et al., 2012).

However, IT affordances driving innovation is only part of the story. What is also important is that these IT affordances are not independent of each other but often work together to produce innovation (Strong et al., 2014). Innovation frequently requires an integrated enactment of the organizational IT (Boudreau and Robey, 2005). The integrated enactment of IT can be realized when individual affordances coalign—that is, when affordances mutually enable, stimulate, and activate each other (Volkoff and Strong, 2013). Consequently, the degree to which each IT affordance aligns with the demands made by the other IT affordances is essential to their collective working to produce innovation (Strong et al., 2014).

Notably, a set of coaligned affordances captures the essence of a technological ecosystem in an organization that generates preferred outcomes, such as innovation (Yoo et al., 2012). For example, consider the observations regarding enterprise resource planning (ERP) systems, which are often regarded as sources of innovation (Lai et al., 2016). ERPs are argued to characterize such ecosystems and offer a platform for organizational functioning (Wareham et al., 2014) in terms of integrated collaboration, knowledge management, and workflow management (Faraj et al., 2011; Lai et al., 2016).

In summary, innovation is fostered by technological ecosystems (Prahalad and Ramaswamy, 2003), which provide the basis for innovative actions (Bhatt and Grover, 2005; Jacobides et al., 2018). In our view, an *effective technological ecosystem* can be best defined as the coalignment of multiple affordances that give rise to a higher-order affordance (Strong et al., 2014), which we have conceptualized as HITA. HITA reflects the creation and use of mutually reinforcing IT affordances and thus reflects this technological ecosystem, enabling an enterprise to develop innovative outcomes, such as new products and services. For example, development of new products and services requires collaborative engagement between employers and customers, typically through IT mediated collaborative mechanisms, (e.g., collaborative IT affordance). This helps update the organizational knowledge base (e.g., organizational memory IT affordance). This organizational knowledge base can then be used to effectively design and manage organizational processes (e.g., process management IT affordance).

On this foundation, it thus follows that collaborative IT affordance, organizational memory affordance, and process management affordance need to work in tandem to develop new products and services (i.e., create innovation). HITA, which captures how well these three affordances work in tandem—and reflects the interconnectedness of modern organizational IT systems—thus can be argued to be crucial to organizational innovation.

At this point, the key issue is to explain how to capture the coalignment of these lower-level affordances so that they can be combined into HITA. We do so by conceptualizing coalignment as a covariance fit between the three IT affordances (Venkatraman, 1989) as explained in the following section.

The nature of HITA: A covariance-based fit

According to Venkatraman (1989) fit can be represented as an alignment between two or more variables. Specifically, we propose that in our particular context, fit captures how well the constituent affordances *coalign* with each other to reinforce the overall IT affordance available to an organization. As mentioned earlier, we call this fit that captures the coalignment as HITA. Given that we are considering a fit between three variables (i.e., affordances of collaboration, organizational memory, and process management), only three possibilities are appropriate: (1) *covariance*, (2) *profile deviation*, and (3) gestalt (all other fits are between two variables, as shown in Table 1). Of these three possible types of fit, *profile deviation* requires a definition of an “ideal” pattern of affordances and to

calculate deviations from that ideal pattern. *Gestalt* requires a definition of clusters of affordances and a search for a degree of coherence between those clusters. Neither of these two approaches is meaningful in our context. Thus, the fit that best captures the coalignment amongst the three IT affordances included in the current study is covariance-based fit.

We embrace covariance fit (also referred to as "fit as covariation") not only through this process of elimination, but also by observing its inherent meaningfulness in our context. Covariance fit is one way of understanding a holistic fit (Cua et al., 2006), and thus readily amenable to our discussion on subordinate and superordinate affordances. Components making up the covariance fit (i.e., subordinate affordances in our case) are often insufficient to describe the entirety of a system and its effects. However, when the components are taken together as a covariance fit, they offer a meaningful conception of how a system affects further outcomes at an organizational level (Cua et al., 2006).

In fact, Venkatraman (1989) describes covariance fit in terms of *internal consistency*, a term related to the alignment of organizational resources. In this case, consistency suggests that the three IT affordances should not be at odds with each other, and that they coalign to produce desirable outcomes such as innovation. From a systemic perspective, this coalignment captures the amount of communality, internal consistency, or harmony between the various IT affordances in an organization, which harmoniously combine to create an IT affordance system (Kast and Rosenzweig, 1972; Phillips, 1972). This is also why we named it the harmonious IT affordance earlier (HITA).

We model covariance fit analytically using confirmatory factor analysis (CFA), in which the latent factor (the fit, which in our case is HITA) represents the coalignment of multiple factors (the individual IT affordances) of interest. This approach is a common strategy for assessing fit (Venkatraman, 1989).[7] A covariance fit is thus a reflective second-order construct:

> *With its emphasis on internal consistency, the covariation perspective is no different from a reflective second-order construct, where the dimensions co-vary* (Polites et al., 2012, p. 34).

In summary, covariance fit captures the logical consistency and link between the first order factors, which are then combined into the second-order fit (Venkatraman, 1989). In our context, the subordinate IT affordances of collaborative affordance, organizational memory affordance, and process management affordance by themselves are not compelling enough to understand how innovation gets affected by technology; however, combining them together into a second-order, superordinate, covariance-based construct is a more powerful and meaningful way to conceptualize this effect. What this also means is that the three subordinate affordances are not in conflict, but rather act in a synergistic manner, leading to better outcomes (such as innovation). Just as pour-in-ability, grasp-ability, and lift-ability synergistically combine to generate the overall affordance of drinkability (see our previous example), so too do the three IT affordances synergistically combine to generate HITA.

Hypotheses development

We propose three hypotheses in this section. The first hypothesis (H1) is most central to our study and thus requires extensive discussion. It proposes that HITA by itself is not enough to produce innovation; it needs to be *actualized* by organizational courage for that purpose and further, that this actualization occurs through a matching fit (one of the other fits discussed by Venkatraman as summarized in Table 1). The second hypothesis (H2) theorizes that this actualized HITA influences exploratory and exploitative innovation differently. Finally, the third hypothesis (H3) posits that exploitative innovation influences exploratory innovation. Together, the three hypotheses propose an integrated model of HITA and courage—using fit as a lens—that predicts exploratory and exploitive innovation. Fig. 1 depicts the research model.

Actualizing HITA: Need for a matching fit between HITA and organizational courage

We develop our central hypothesis, H1, in three parts. First, we explain why HITA needs to be actualized in order to generate innovative outcomes. Second, we elaborate why a fit between organizational courage and HITA (conceptualized as actualized HITA) serves as an antecedent to innovation. Third, we theorize the nature of this actualization, that is, a match-based fit between HITA and organizational courage.

Need for actualizing HITA for innovation by collective human agency

HITA represents the overall IT affordance within an organization and is defined as the covariance fit between three constituent affordances. Essentially HITA captures the extent to which the three IT affordances (process management, collaboration, and organizational memory) work in *tandem*. In other words, HITA captures the *effective* overall IT affordance of an organization. However, despite HITA's conceptualization as a superordinate affordance, it still remains an affordance and therefore an actionable potential

[7] An excellent example of a covariance fit is found in the work of Beltrán-Martín et al. (2008). They conceptualize a construct called High Performance Work System (HPWS). HPWS is conceptualized in terms of four factors (selective staffing, comprehensive training, developmental performance appraisal, equitable reward systems) and one observable indicator (performance-based pay). HPWS captures how well these dimensions of HPWS are internally consistent (or aligned) with one another. Statistically, this implies that the common variation of HPWS dimensions is explained by a latent factor (HPWS) that captures their covariance. In modeling terms, the first-order factors now operate as dependent variables of the second-order latent factor.

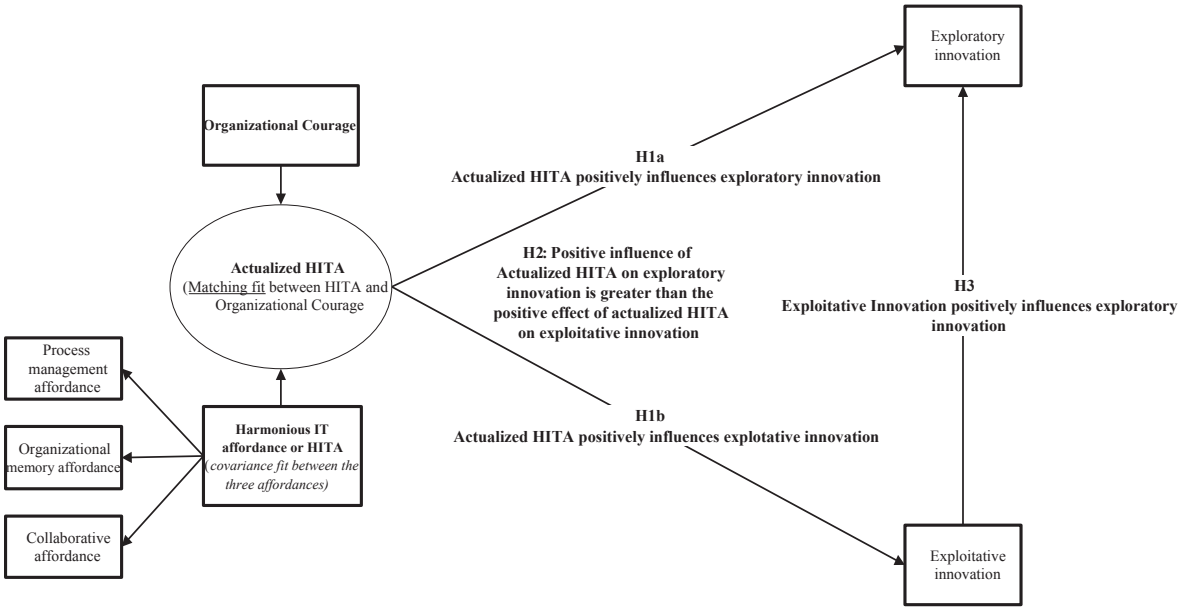

Fig. 1. Our proposed theoretical model linking actualized HITA and innovation.

(Burton-Jones and Volkoff, 2017). Literature notes that affordances are only potentials for action and have to be effectively used to produce outcomes (Dremel et al., 2018; Du et al., 2018; Volkoff and Strong, 2017). We suggest actualization of an affordance involves effective use of that affordance to produce concrete outcomes (Burton-Jones and Volkoff, 2017; Strong et al., 2014). The need for actualization is aptly described by Du et al. (2018), as follows:

> Affordances do not guarantee results, because they refer to action potentials rather than actual actions or final outcomes. To transform potentials into results, actors must take goal-oriented actions to use the technology to achieve an outcome…[this is] known as 'affordance actualization' (p. 2).

Therefore, if HITA is to produce innovation, it needs to be actualized first, and this actualized HITA will influence innovative outcomes (Strong et al., 2014).

An IT affordance may provide multiple possibilities for action but the actualization itself depends on human agency and intentionality and the goal of the actualization (Boudreau and Robey, 2005; Zammuto et al., 2007). Anderson and Robey (2017) reiterated this assertion, arguing that affordances can differ in how potent they are in achieving goals; this potency is contingent upon, for example, human beings who utilize this affordance. That is, collective human agency (in our case at the level of the organization) is paramount for the enactment of the superordinate IT affordance (HITA) to produce organizational innovation. Consequently, the *actualization* of the HITA for innovation can be formally defined as the coupling of HITA with the collective human agency (of the organization) that ultimately enables the generation of favorable outcomes, such as innovation.

Moving forward from the definition of actualized HITA, a natural question arises: what form of collective human agency is most potently coupled with HITA to produce innovation? Anderson and Robey (2017) note that there are multiple ways in which the human agency of a collective can act upon an existing affordance to actualize it for a specific outcome. Therefore, we need to understand what fundamental characteristic of the agent (here, the organization) is critical in actualizing the affordance (HITA) specifically to produce innovation. We posit that the human agency that can actualize HITA at the organizational level for innovation should itself be fundamental to innovation. We note here that virtue ethics is an agent-based approach (Mingers and Walsham, 2010) and that courage is a key organizational virtue necessary for innovation (Chatterjee et al., 2015), and therefore propose that organizational courage best represents this human agency within the organizational collective for actualizing HITA for innovation. We elaborate on this rationale in the next section.

Fit between organizational courage and HITA as an antecedent to innovation

The role of organizational courage and its fit with HITA for influencing innovation can be understood by (1) understanding the implications of organizational courage in general, including those in an innovation context, and (2) linking those implications to what is needed to actualize HITA.

The implications of organizational courage in an innovation context has been widely suggested in existing literature. To begin, it has been claimed that "it takes…organizational courage to attempt a cultural transformation, especially when entering the unknown and testing the concepts with people in actual work situations" (Oshiotse and O'Leary, 2007, p. 14). Innovation is fundamentally characterized by some element of unknown and also requires testing and experimentation.

Again "the concept of organizational courage is related with the process of managing organizational fears" (Taşdelen and Polat, 2015, p. 575). If one notes that the key to managing innovation is to reduce the fear of failure (Kuyatt, 2011), the link between innovation and courage becomes evident. In fact, recent works on the salience of organizational courage has noted that:

> There are many theoretical and anecdotal claims that courage will be good, in general ways, for business…because it solves problems, *fosters innovation* and creativity…[emphasis added] (Detert and Bruno, 2017, p. 602)

Arguably, a courageous organization engages in creativity, constructive exploration, reduction of inconsistent ideas, and challenges the status quo, thus "supporting and improving firm innovativeness" (Akgün et al., 2009, p. 107). Improvization, often a key element of innovation (Chatterjee et al., 2015) frequently engenders uncertainty. Organizations require strong elements of courage to be able to navigate through such uncertainty and chart a way forward (Kanter, 2002).

Innovation is often stimulated by the presentation of ideas that are unconventional, and often people need courage to present unconventional ideas (Faste, 2011). For example, Quinn and Worline (2008) recount the tragic events of 9/11 where crew members and passengers aboard flight 93 organized a counterattack against the hijackers. Clearly, this innovative reaction to the emergency required collective courage. In summary, organizational courage engenders organizational innovation by fostering, supporting, and implementing challenging ideas (Jiang et al., 2012): putting forward creative and risky ideas, which are fundamental to innovation, often requires courage (Chang et al., 2014).

There are other implications of organizational courage that are particularly salient to innovation. Organizational courage is central to a number of factors that are crucial to innovation—such as IT readiness, organizational learning capability, or absorptive capacity. Courage stimulates the desire to question organizational status quo in a constructive manner, thus being crucial to the improvement of organizational routines that build absorptive capacity (Hart et al., 2016; Van Dyne and LePine, 1998). A learning environment, which is crucial to developing learning ability, includes courage and ability to take risks as primary characteristics (Thuy Pham and Swierczek, 2006). Simply put, "… organizational learning…means surfacing and **re-examining** all of those inarticulate assumptions about the firm and its business environment which, while **never explicitly scrutinized or even acknowledged**, drive much of what the firm actually does" [emphasis added] (Kiernan, 1993, p. 10). Scrutinizing organizational assumptions requires questioning the status quo, which is not possible without courage (Amos and Klimoski, 2014).

From the above discussion, one can summarize that the significant implications of organizational courage in an innovation context are the development of key organizational characteristics crucial to innovation. Courage is a fundamental organizational virtue, and a courageous organization typically develops the necessary characteristics (such as readiness, ability, and absorptive capacity) through fearlessness and risk-taking, cultural transformation, constructive exploration, and experimentation. Based on this evidence, it is logical to infer that a courageous organization will already have developed these characteristics, and will use them, through appropriate actions that actualize IT affordances.

Again, courage provides an organization with characteristics that are key to innovation. If one examines the literature, it is evident that *IT affordances require similar organizational characteristics for their actualization that a courageous organization exhibits*. For example, a recently published case study of how business analytics affordances were actualized in the case of Rovio Entertainment (Tim et al., 2018), discusses that this actualization required "constant adjustments to products"—amounting to experimenting with the products. Similarly, another study highlights how experimentation plays a key role in actualizing affordances (Du et al., 2018). A third study (Dremel et al., 2018) shows how actualizing, especially for innovation purposes, needs changes to organizational culture, practices, and processes. In fact, the recurrent theme of all these studies is that actualization of affordances to generate innovation needs experimentation and changes to the organizational status quo and therefore, the courage for "structuring uncertainty, which…[involves]…efforts to effect constructive change in the workplace" (Schilpzand et al., 2015, p. 63).

To actualize an IT affordance for producing innovation, we need organizational characteristics such as readiness, learning ability, and absorptive capacity, among others. By fostering experimentation, cultural change, and constructive exploration, organizational courage ensures that the organization has these characteristics to actualize the action potential that the IT affordance(s) provide. Given that "…affordances may never be actualized…in reality unless there exists…the necessary capability…[and motivation] by organizational goals that can be fulfilled by actualizing the affordance" (Tan et al., 2016, p. 742), organizations need to develop certain crucial capabilities. Organizational courage creates the foundation of such capabilities.

Stated differently, the actualizing role of courage is evident because a courageous organization develops key characteristics for effective use of IT affordances, by facilitating the pursuit of risky and challenging opportunities (Koerner, 2014). HITA is an IT affordance that is necessary for innovation, but this affordance can be fruitfully implemented only if the organization is willing take risks and does not shy away from structural or cultural changes that this experimentation can foster (Detert and Bruno, 2017). In conclusion, one can argue that the actualization of HITA for the purposes of generating innovation, requires characteristics such as boldness, purposive decision-making, and mobilization. Courage fulfills this need as it can help to develop an organization's readiness to embrace dangers, risks, and uncertainty (Kaptein, 2017).

Our basic proposition therefore, is that organizational courage is necessary if organizations engaged in innovation are to experiment with risky outcomes and not to be intimidated by the possibility of failure (Koerner, 2014). If IT affordances offer a means of achieving innovation, they can effectively do so if the organization is courageous. If an organization has courage, it will try to engage with the IT affordance and actualize it to produce innovation; on the other hand, if it is fearful of the riskiness of innovation, it will shy away from engaging in actions that are key to actualizing the affordance. That is why, given the IT affordances and innovation context, courage serves as a compelling actualizer of HITA, and this actualized HITA is an important antecedent to innovation. In summary, *actualizing HITA for innovation requires adjustments, experimentation, and purposeful changes to organizational practices and processes, and it is organizational courage that ensures that these requirements are met.*

To finalize our argument on why courage actualizes HITA for innovation outcomes, we provide an illustrative example from the literature. This example is about the design and construction of the Peter B. Lewis Building, as reported by Carlo et al. (2012). This study investigated a highly risky and complex project: the design and development of the Peter B. Lewis Building. This was a truly innovative project, as it involved working to construct a building with one of the most challenging surface geometries. However, despite the huge risk, the project was completed practically on time and budget. The reason was that the project owners, Gehry Partners, were a typical example of a courageous organization, who were often "fighting a war" (Carlo et al., 2012, p. 1092), but did not quit; rather they continuously leveraged the affordances provided by the computer-aided three-dimensional interactive application (CATIA) so that they could create "on demand decision support to diagnose and fix problems" (Carlo et al., 2012, p. 1098). Because they were a courageous company, Gehry Partners was not overwhelmed by the challenges of the project, they took every step to anticipate and learn from potential problems, often using the affordances provided by the software to create new practices. Simply put, they were leveraging their courage and resilience to continuously actualize the existing affordances of CATIA to ensure that the innovation—the ultimate construction of the building—was on track.

Actualization of HITA by courage: A matching fit

Thus far, our logic for the actualizing role of courage to produce innovation can be summarized as follows. From an IS perspective, to investigate the relationship between IT and organizational innovation, we should first examine what potentials for action the IT provides (i.e., the IT affordances). HITA, as the superordinate affordance that is a covariance fit between the three lower level affordances captures that. A high level of HITA indicates that the organizational IT provides highly aligned affordances for collaboration, process management, and organizational memory.

However, to actualize HITA effectively, organizational courage should also "match" the level of HITA (i.e., in our case if HITA is HI, courage should also be HI). In his review of the different kinds of fit conceptualizations, Venkatraman (1989) elaborates on the matching fit (please see Table 1). The match between two constructs (at the same level, i.e., HI-HI or LO-LO) implies that the absolute difference between them is small (He and Wong, 2004). In the current study, this means that the absolute mean difference between HITA and courage is small, as we consider a match between the two constructs at the same level (HI). When a matching fit occurs between two constructs, it indicates that the two constructs are in alignment (Neville and Menguc, 2006).

In the context of our discussion, if HITA and organizational courage are misaligned, then innovation cannot happen. This is because lack of matching fit between HITA and organizational courage implies that they are incongruent, thus affecting the effectiveness of both (Venkatraman, 1989). For example, if HITA is high, but organizational courage is low, then the organization fears the risks involved in actualizing HITA for innovation. Similarly, if HITA is low, then a courageous organization cannot actualize HITA because there is not much to actualize. In other words, courage and HITA need to be congruent or matching (Volberda et al., 2012), where a high level of courage matches a high level of HITA. This match is crucial because only then can courage actualize HITA for innovation.

To conclude, actualization of HITA by courage—captured by *actualized* HITA—is a *matching fit*, where an organization needs a high level of courage as well as a high level of harmony amongst its IT affordances (a higher level of harmonious fit) to be innovative. In other words, HITA and courage matched together should be able to better influence innovation.

Integrating all our arguments in this section, we theorized that (1) HITA needs actualization to produce innovation; (2) Organizational courage serves as an actualizer of HITA; and (3) This actualization is best captured by a matching fit, where a high level of organizational courage matches the high level of HITA. This logic is applicable for both forms of innovation, and thus we present our central hypothesis:

H1. An actualized HITA, captured by a matching fit between organizational courage and the HITA, positively influences both (a) exploratory innovation and (b) exploitative innovation.

The differential effects of the actualized HITA on innovation

Whereas the fit between organizational courage and the HITA undoubtedly influences both forms of organizational innovation, we theorize that it has differential effects on exploratory versus exploitative innovation. This hypothesis is a corollary to H1. Specifically, in exploratory innovation, the organization experiments with divergent forms of thinking to generate multiple positive outcomes (Smith and Tushman, 2005). Exploratory innovation requires an organization to attend to emerging radical possibilities (Neill et al., 2007). It often challenges existing technologies or products and often focuses on creating a completely new knowledge base; it therefore has uncertain revenue potential and a high amount of risk.

By contrast, exploitative innovation focuses on *local search* (e.g., immediate customer markets as compared to international customer markets); organizations innovating in an exploitative manner develop immediate competencies in organizational routines and technology by reusing existing channels of resource accrual and distribution. That is why exploitative innovation often focuses on the current customer base (Andriopoulos and Lewis, 2009), where the focus is on building and refining existing knowledge to better attend to immediate needs, such as the organization's customer service (Jansen et al., 2009). Organizations are more willing to invest in exploitative innovation, because it often has predictably positive returns, which are frequently immediate (Wu, 2012). Therefore, it is obvious that in exploitative innovation, there is less risk-taking involved than in exploratory innovation. As explained by Hauser et al. (2006), exploratory innovation, which is radical in nature, often implies ambitious aims such as "fivefold performance improvements" or "30% or more in cost reduction" and therefore, "the unknowns and risk are enormous compared to those in…

[exploitative innovation] (p. 702). Such enormous differential risks arguably increase the demand on organizational IT and courage. Put differently, the actualized HITA is more potent in generating exploratory innovation, with its higher risks, than exploratory innovation. Therefore:

H2. The actualized HITA has a stronger influence on exploratory innovation than on exploitative innovation.

The relationship between exploitative and exploratory innovation

Hypothesis 3 advances the conceptualization of innovation further by theorizing a direct and causal link between exploitative and exploratory innovation. Although the existing literature frequently considers this dual focus on exploitative and exploratory innovation as a paradox that an organization must resolve (Andriopoulos and Lewis, 2009), we theorize that exploitative and exploratory innovation may not be completely at odds because one may lead to the other. Assuming that an organization can achieve balance between the two (i.e., we assume some form of ambidexterity), there is evidence to support the notion that exploitative innovation positively influences exploratory innovation.

Implementation of innovation within an organization can be construed as a collective knowledge-building action that succeeds when innovation agents mobilize others to their cause. Through intrapreneurship, core organizational actors (bound to exploitative innovation) engage socially with peripheral organizational actors invested in exploratory innovation (Sgourev, 2013). This results in "collective action, where movements assemble resources,…[legitimize]…the novelty [i.e., exploratory innovation], and integrate it within the prevalent order [e.g., exploitative innovation]" and through this "individual and collective agency, contradictory interests [i.e., exploitative innovation and exploratory innovation] are aligned around a breakthrough [i.e., exploratory] innovation" (Sgourev, 2013, p. 1602).

Other compelling evidence supports the suggestion that exploitative innovation can lead to exploratory innovation. Research (e.g., Majchrzak et al., 2004) explained that knowledge generated from incremental innovation (i.e. exploitative innovation) can be recombined in new ways to generate new knowledge/products (i.e. exploratory innovation). Exploitative innovation tends to result in short-term benefits (Chao et al., 2009) and has positive, predictable, and immediate returns on investments (Wu, 2012); this revenue likely creates more possibilities for investments in exploratory innovation. Mature, competitive organizations can engage in exploratory innovation due to their stable revenue base built from exploitative innovation (Tushman and O'Reilly, 1996). In fact, exploitative innovation enables organizations to "reinforce their competitiveness" and is thus "competence-enhancing" (Sircar et al., 2001, p. 466). Arguably, enhancement of organizational competencies pave the way for further exploration (Hadida et al., 2015). Thus,

H3. Exploitative innovation positively influences exploratory innovation.

Methodology

Pilot testing

Appendix A describes the measures we rigorously developed for the current study. Based upon a review of their appropriateness for the current context, we either directly adopted or adapted the survey questions from prior studies; as a result, the wording of some items was changed. Following these revisions, the survey instrument was administered first to 35 individuals with significant work experience. The adapted items were further refined based upon participant feedback and reviewed again for appropriateness. The refined instrument was pilot tested a second time on a different sample of 31 people who had significant work experience. We made a few additional minor changes, and following a final review, the instrument was deemed to exhibit sufficient face validity.

Data collection via qualtrics

Following recent guidance in the literature, we administered the survey online via the third-party market research company, Qualtrics™. Recruiting participants via Qualtrics has become increasingly popular across business disciplines (Dumas et al., 2013; Han et al., 2015; Hardisty and Pfeffer, 2016; Tucker, 2015). There are multiple reasons for this popularity. Individuals recruited by Qualtrics are appropriate, motivated, and willing to participate for compensation. Thus, researchers using online market research companies (such as Qualtrics) can mitigate possible biases such as those due to inappropriate respondents, respondent irritation, or fatigue. In a recent study, Lowry et al. (2016) explained how online data collection can be efficacious—especially for organizational research—if properly conducted in terms of sampling, respondent identities, distorted/falsified responses, incentives, data quality, and generalizability. In the current study, we followed the latest procedures for online panels to improve the quality of the results by randomizing the questions, including attention traps, verifying the IP addresses of the respondents and scrutinizing for possible duplicates, and working with the provider to provide strong pre-screeners for our target participants.

Typically, in a Qualtrics-based study, researchers indicate eligibility criteria for the participants along with a request for a specific sample size (Hardisty and Pfeffer, 2016). Accordingly, we asked for 250 respondents[8] (255 surveys were returned) who were current

[8] To detect the expected small effect size for IT innovation (Melville et al., 2004; Zhu et al., 2006), a power analysis indicated that approximately 200 respondents was required.

Table 2
Summary of respondent demographics from (US Sample; n = 255).

Demographic	Mean	St. Dev.
Age	44.46	12.54
Number of people that respondent manages	45.36	362.95
Gender	126 males (49.6%)	
	128 females (50.4%)	
	1 not reported	
Highest education obtained	High school/equivalent	85 (33.5%)
	Associate's	48 (18.9%)
	Bachelor's	83 (32.7%)
	Master's	32 (12.6%)
	Doctoral	6 (2.4%)

Table 3
Summary of Organizational Demographics (US Sample).

Demographic		Number (percentage)
Organization size	Under 100 employees	66 (25.8%)
	101–500 employees	63 (24.7%)
	501–1000 employees	21 (8.2%)
	Over 1000 employees	105 (41.2%)
Industry	Manufacturing	25 (9.8%)
	Distribution and retail	22 (8.6%)
	Services	30 (11.8%)
	IT products or services	13 (5.1%)
	Utilities	4 (1.6%)
	Education	26 (10.2%)
	Finance	13 (5.1%)
	Other	122 (47.8%)

organizational employees in the US (see Tables 2 and 3). The criterion was that they should be relatively senior in their current company, so that they would have a reasonable idea of how IT was used in their organization. Demographic analyses revealed that organizational tenure averaged 22.74 years with more than 94% of the respondents having 10 years or more of experience in the current company. In addition, most held senior managerial positions evidenced by their management of 45 employees on average. Demographic analyses further revealed that the sample included both mid-level managers and C-level executives. By collecting data across different levels of seniority, we reduced the possible bias in our results that could arise from focusing on only a particular rank of employees (e.g., only mid-level managers). Thus, our sample increases the generalizability of our results.

Measures

Appendix A describes the measures used in the current study. In addition to the measures listed in Appendix A, an open-ended survey question was included so that the respondents had an opportunity to report any problems while completing the survey; no participants raised issues related to the survey, thus increasing our confidence in its appropriateness for the sample.

Analysis

We used a covariance-based SEM (CB-SEM) tool, STATA (version STATA/SE 15.1), for our analysis using maximum-likelihood estimation. We assessed convergent and discriminant validities using STATA's confirmatory factor analysis (CFA). Following CB-SEM standards, the model fit for the measurement model was good ($X^2_{(217)} = 615.867$; RMSEA = 0.085; CFI = 0.927; TLI = 0.915; SRMR = 0.093; CD = 1.000). Results of the items fit to constructs, at the first-order level are also included in Appendix A.

Convergent validity was established by large and standardized loadings for all constructs, *t*-values ($p < 0.001$) that exceeded statistical significance and by the ratio of factor loadings to their respective standard errors that exceeded $|10.0|$ (Hair et al., 2006). We established divergent validity by determining that the average variance extracted (AVE) for each latent variable was above acceptable levels. Furthermore, we report that construct correlations to other latent variables were less than the square root of the AVE score. As a final check on discriminant validity, we calculated latent variable scores and found that items more strongly loaded on their respective latent variable scores. These tests all support discriminant validity. Summary statistical information for all first-order latent variables is shown in Table 4 (AVEs are bolded in the diagonal). Importantly, the high correlations between the first-order latent variables of the three affordances justify why they are highly interrelated (as we theorized) and thus support our conceptualization as to why they should be aggregated, using a covariance fit, into a second order latent variable, HITA (again, consistent with our model). Recall our earlier point that a covariance fit can be represented simply as a second-order reflective construct (Polites et al., 2012). Thus, we represent HITA as a reflective second-order construct. Just as individual items of a reflective

Table 4
Descriptive statistics for first-order constructs.

Latent Construct	Mean	SD	1	2	3	4	5	6
1. Process management affordance	4.97	1.28	**0.842**					
2. Org. memory affordance	5.03	1.21	0.756	**0.820**				
3. Collaborative affordance	5.03	1.37	0.710	0.790	**0.916**			
4. Organizational Courage	4.66	1.31	0.422	0.397	0.381	**0.748**		
5. Exploratory innovation	5.06	1.20	0.611	0.604	0.637	0.556	**0.891**	
6. Exploitative innovation	4.86	1.35	0.557	0.536	0.554	0.514	0.823	**0.922**

first-order construct should be highly inter-correlated, the individual IT affordances (which can be looked upon as the "items" for HITA) should also be highly correlated. Thus, the high intercorrelation between the IT affordances (organizational memory, collaboration, and process management) demonstrates that using them to operationalize and measure HITA is appropriate. In addition, the high correlation between exploratory and exploitative innovation further supports our prediction that there exists a strong relationship between them (i.e., our hypothesis, exploratory innovation → exploitative innovation).

Common method bias

To test for common method bias we included measurement items for a theoretically unrelated variable in the survey instrument. If the unrelated variable is not statistically related to either of our dependent variables (i.e., exploratory and exploitative innovation), common method bias is not a concern. In the current study we included propensity to trust as the unrelated variable and found that it did not have a significant relationship with either exploratory innovation ($\beta = 0.032$; ssd. = 0.240; $z = 0.20$; $p = 0.838$), or exploitative innovation ($\beta = 0.057$; ssd. = 0.162; $z = 0.56$; $p = 0.288$). Thus, we conclude that common method bias is not likely to have influenced our results, and it shows that the high correlations (such as between the lower level IT affordances) are for appropriate theoretical reasons and not because of common method bias. It should be noted that high correlations are only a problem if (1) they are excessive (e.g., > 0.9), (2) coupled with high multicollinearity, (3) are not theoretically appropriate, or (4) caused by common method bias. If neither of these are true, high correlations simply reflect a high effect size between two theoretically appropriate relationships.

Control variables

Commonly included controls in innovation studies are organizational size (Camisón and Villar-López, 2014), industry type (Hsu and Chang, 2011), and attributes of the respondents (Larsen and Wetherbe, 1999). Thus, we included them along with other relevant demographic controls in our study. Specifically, we included industry type, number of employees in the organization (surrogate for organizational size), and respondent age, gender, education level, tenure at organization, and number of employees supervised. Notably, none of the control variables were significant predictors of the dependent variables. As a result, we omit the insignificant results from the final models to simplify their presentation.

Assessing the constructs of fit

Covariance fit for HITA

Following Venkatraman (1989), researchers can estimate fit in six different ways. As noted, covariance fit, which is conceptualized as an internal consistency among the underlying variables, captures our conceptualization of HITA. Covariance fit requires that all components must be present for the overall fit to occur. Empirically, this fit is assessed using a factor analysis that verifies whether all the variables covary. In our study, an exploratory factor analysis supports this notion, as the first eigenvalue (7.75) is the sole value above 1.00, the level at which factors are typically retained. This first eigenvalue also accounts for 92.6% of the variation. Covariance fit is further supported by results showing that the second-order HITA factor is more predictive of the dependent variable (based on the R^2 value) than the dimensions' individual main effects on the dependent variable (Venkatraman, 1989). Table 5 reports the results of these tests against both exploration and exploitation.

Matching fit for actualized HITA

Absolute difference is one of the prevalent ways in which a matching fit has been operationalized in the literature (Chan et al.,

Table 5
The test of covariance fit for the harmonious IT affordance (US Sample).

Dep. Variable *(Y)*	R^2 for main effects model	X^2 for main effects model	R^2 for covariance fit model	X^2 for covariance fit model	Fit as covariance accepted?
Exploratory innovation	0.407	267.74	0.483	124.47	Yes
Exploitative innovation	0.406	278.47	0.501	138.90	Yes

1997; He and Wong, 2004; McLaren et al., 2011; Ramasubbu et al., 2015). We have followed this precedent. In his seminal paper on fit, Venkatraman (1989) explains the operationalization of matching fit by noting the following for a system of three variables (X, Y, and Z, where X and Z are the predictor variables and Y the criterion variable):

> …|X – Z| indicates the lack of fit between X and Z, and the performance implications of fit are tested by examining the impact that this variable has on performance. The formal specification of the equation follows: $Y = a_0 + a_1X + a_2Z + a_3(|X - Z|) + e$. If the coefficient a_3 is statistically significant in [the] Equation…, then a hypothesis of performance effects of fit is supported" (p. 431).

In our context, X is HITA, Z is organizational courage, and Y is either exploratory or exploitative innovation, as the case may be. Our premise is that a high level of X (HITA) should be matched by a high level of Z (organizational courage) to produce Y (either form of innovation). If X (HITA) is high but Z (organizational courage) is low, then the organization, in spite of having the technology-enabled resources (high HITA), will be reluctant to experiment and challenge the status quo, thus compromising innovation. Again, if X (HITA) is low, but the Z (organizational courage) is high, then the organization may try to take bold decisions, experiment, and change the status quo, but in the absence of IT-enabled resources (low HITA) the effort will likely fail, thus again compromising innovation. However, if X (HITA) is high and Z (organizational courage) is high, then not only does the organization have the resources (high HITA) but it is also able to use those resources boldly and make risky decisions that are often necessary for innovation.[9]

Thus, following Venkatraman's (1989) definition, in our case, the closer X and Z are, the better the fit (or alignment) between them. The absolute difference measures the closeness between X and Z and thus is a measure of fit. The closer the absolute difference |X-Z| is to zero, the more aligned (matched) X and Z are. The further it is away from zero, the more misaligned (mismatched) X and Z are. Thus, to examine the effect of fit (between any variables X and Z) on any variable Y, we regress the fit (absolute difference between X and Z) on Y, per Venkatraman's equation. If the coefficient is significant, then we can conclude that the fit between X and Z is a strong predictor of Y.[10]

Thus, to assess the fit of HITA and organizational courage, we first created the measurement model for each latent variable, and based on the factor loadings, extracted a score for each case. We then regressed the scores onto exploration and exploitation in two separate equations. According to Venkatraman (1989), if the coefficient for the absolute difference between the terms is a significant predictor of the dependent variable, then fit as a match exists. Table 6 summarizes the results of the analyses.

Having shown the fit of HITA and that organizational courage and HITA support a match fit, we now explain how we operationalized the matching fit variable for our final analysis. Given that a high fit between the latent variable scores should result in a high fit, we reverse the absolute difference between the scores (HITA and organizational courage). However, this transformation provides extremely high weights for scores that were less than one standard deviation from each other. Given the non-normality of this distribution, we thus performed a naturalized logarithmic transformation, which resulted in a nearly normal distributed of the variable. This transformation is shown in Formula (1).

$$Y = \ln(1/(X_{org\_courage} - X_{HITA})) \quad (1)$$

Hypotheses testing results

Following our assessment of the fit constructs, we were then able to test the remainder of our model, including the effects of the actualized HITA on exploratory and exploitative innovation. We estimated all models with the control variables included (age, gender, education level, work experience, tenure, number of employees supervised, and industry type), and all were insignificant predictors of our dependent variables. Table 7 summarizes the results of this final test, which are also depicted in Fig. 2.

Actualized HITA had a significant effect on both types of innovation, supporting H1. The effect of actualized HITA on exploratory innovation is higher than on exploitative innovation (consistent with H2). To test H2 formally, we used a Wald test and the Bonferroni method to determine whether the coefficients for the relationships predicting exploratory innovation and exploitative innovation from the actualized IT affordance were equal. The results of our test show that they are not ($F = 3.44$; $p < 0.000$), indicating that the relationship between the actualized HITA with exploration is indeed stronger than the relationship with exploitation. Finally, consistent with H3, the results show a strong influence of exploitative innovation on exploratory innovation.

A follow-up study retesting the theory in a Chinese context

Whereas the previous study was conducted in the US context, we also conducted an empirical study in a different context to

[9] If X (HITA) and Y (organizational courage) are both low then, of course, they match (are aligned), but from a theoretical standpoint, this alignment is not meaningful enough to produce innovation. In this case, the organization has both low IT-enabled resources and low boldness to experiment using those resources. Consequently, they are unlikely to innovate. This case is thus excluded from our analysis.

[10] Ramasubbu et al (2015) also showed an alternate way of analyzing matching fit using residual scores. This alternate technique is also briefly mentioned in Venkatraman's (1989) paper. In this technique, X is regressed onto Z (or vice versa) and the residuals calculated. These residual scores are then regressed onto Y and if the coefficient is significant, matching fit is interpreted to exist. To ensure that our calculation of matching fit is consistent regardless of the technique used, we also conducted the residual score analysis, as noted in Ramasubbu et al. (2015). Much like their study, the results of the absolute deviation method and the residual score analysis method were also consistent in our study.

Table 6
Summary of the matching fit test for organizational courage (US Sample).

Dep. variable *(Y)*	Constant term (a_0)	HITA (a_1X)	Org. courage (a_2Z)	Absolute difference (a_3|X − Z |)	Matching fit accepted?
Exploratory innovation	0.067 (1.08)	0.622 (14.05)***	0.430 (10.48)***	−0.085 (−1.54)	Yes
Exploitative innovation	0.053 (0.99)	0.538 (14.11)***	0.318 (9.00)***	−0.026 (−0.54)	Yes

Notes: *t*-values are shown in parentheses; $*p < 0.05$; $**p < 0.01$; $***p < 0.000$.

Table 7
The test of the actualized HITA onto exploration and exploitation (US Sample).

Relationship	Coef.	*t*-value	*p*
Actualized HITA → Exploratory innovation	0.390	7.49	0.000
Actualized HITA → Exploitative Innovation	0.346	3.98	0.000
Exploratory innovation → Exploitative innovation	0.720	28.55	0.000

$X^2_{(18)} = 72.844$; RMSEA = 0.071; CFI = 0.964; TLI = 0.944; SRMR = 0.030; CD = 0.964
$R^2_{(Exploration)} = 0.574$; $R^2_{(Exploitation)} = 0.172$.

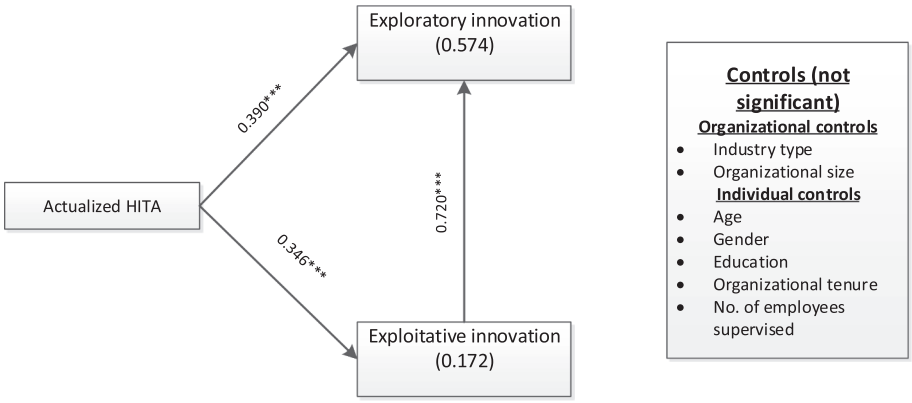

Fig. 2. Summary of final model test.

further test our theory's generalizability (Lee and Bobko, 1994). Scholars often call for the observation of organizational phenomena in both Western and Chinese contexts (Leung et al., 2013). In fact, there is emerging interest in the Chinese economy, particularly due to the rapidly growing Chinese Economy in the last couple of decades. There are even claims that "China is out-innovating the West" (Steinfeld, 2010, p. 34) and that "China's rise in innovation capability poses a threat to U.S. leadership in science and technology" (Fan, 2014, p. 726). In fact, it is noticeable that R&D expenditures in China—a common indicator of increasing innovation—increased even faster (a 14-fold increase from 1991 to 2009) than its economy which became the second largest economy around 2009 (Fan, 2014).

It has also been noted that Chinese organizations have significantly enhanced their innovation capabilities through years of learning and cooperation with foreign firms and other partners (Chung and Tan, 2017). Especially in China, organizations are making substantial investments in IT, to the effect that IT has been argued to become an increasingly transformational agent in Chinese Organizations (Chen, 2010).

Given this backdrop, China is an appropriate context to conduct a follow up study on IT and innovation. It also provides an alternate cultural context to the Western world, making it even more appropriate to test the universal applicability of a theory. Accordingly, we conducted the second study in the People's Republic of China. This replication also further addresses concerns of common method bias, including concerns as to whether the results were an artifact of our US context.

Data collection and analysis

For consistency purposes, we used the same data collection approach and survey items from the first study in the follow-up study. We contracted the services of a China-based, third-party online market research company and the participants were selected based upon the same criteria as in the US. They were compensated by the online market research company for completing the survey.

The contracted sample size was 250 (the same as for US); the firm returned 267 responses. The survey was administered in Mandarin Chinese. To ensure cross-cultural equivalence and diminish threats to validity, we hired two professional translators, overseen by a third translator, to translate the survey. To further ensure its equivalence, the survey was then back translated from Mandarin to English. Tables 8 and 9 summarize the individual and organizational demographics for the Chinese sample. Again, we

Table 8
Summary of respondent demographics (China Sample; n = 267).

Demographic	Mean	Standard Deviation
Age	34.92	7.63
Number people currently managed	49.37	107.66
Gender	150 males (56.8%)	
	114 females (43.2%)	
	3 not reported	
Highest education obtained	High school/equivalent	7 (2.6%)
	Associate's	47 (17.6%)
	Bachelor's	183 (68.5%)
	Master's	27 (10.1%)
	Doctoral	3 (1.1%)

tested for the appropriate fits and found support for fit as covariance for HITA, as well as the matching fit between organizational courage and HITA (see Tables 10 and 11). Table 12 and Fig. 3 report the final theory testing for the Chinese sample. As the results show, all hypotheses were supported. To test H2 formally for the China sample, we tested whether the coefficients for the relationships between exploration and exploitation and the actualized IT affordance were equal. The results indicate that they are distinct ($F = 20.12$; $p < 0.000$), thus supporting H2.

Discussion

Interpretation of the results

H1, H2, and H3 were all supported in both studies. Our results also show strong support for the contingency-based perspective of innovation, which, arguably, provides a better understanding of how IT and organizational factors combine to generate innovation (Oh and Pinsonneault, 2007). The matching fit between HITA and organizational courage to generate innovation outcomes captures this contingency, which implies that organizations need high levels of both courage and IT affordance to innovate. This implication is consistent with recent research claiming that actualization of the value of IT is highly contingent upon human deliberation (Henfridsson and Lind, 2014). That is, coaligned IT affordances are necessary, but not sufficient, for innovation. In fact, the creation of an innovation ecosystem is also contingent upon human courage, which mindfully employs coaligning affordances to innovate. Unless an organization is bold enough to leverage affordances and to leverage them correctly, innovation is not sustainable.

Our study also shows that courage is more salient to exploratory innovation than exploitative innovation. This is noticeable since the actualizing effect of courage for exploratory innovation is greater than that of exploitative innovation. This is not surprising as exploratory innovations are more radical, and courage is more necessary in radical innovations where changes may potentially be disruptive (Sandberg, 2007). Incremental innovations do not disturb the status quo as much as radical innovations do and therefore are less risky. Consequently, the role of courage—and thus actualized HITA which represents a match-based coupling of HITA with courage—is comparatively muted.

The results highlight the role of exploitative innovation in influencing exploratory innovation. Although this aligns with our predictions, it is important to note that the literature often treats exploratory and exploitative innovation as being at odds with each other (e.g., Mueller et al., 2013). Our results show that this is not necessarily the case. In the contemporary view of organizations, especially those based on the notion of organizations as complex adaptive systems (Nan, 2011), innovation contexts are often characterized by radical changes caused by incremental ones (Chae, 2014). If we subscribe to the view, then exploitative, incremental innovation can, over time, accrue enough resources (e.g., revenue and expertise) to enable an organization to engage in more radical

Table 9
Summary of organizational demographics (China Sample).

Demographic		Number (Percentage)
Organization size	Under 100 employees	49 (18.4%)
	101–500 employees	103 (38.7%)
	501–1000 employees	62 (32.3%)
	Over 1000 employees	52 (19.6%)
		1 not reported
Industry	Manufacturing	102 (38.2%)
	Distribution and retail	24 (8.9%)
	Services	21 (7.8%)
	IT products or services	23 (8.6%)
	Utilities	23 (8.6%)
	Education	23 (8.6%)
	Finance	22 (8.2%)
	Other	29 (10.9%)

Table 10
Summary of the covariance fit test for harmonious IT affordance (China sample).

Dep. Variable *(Y)*	R^2 for main effects model	X^2 for main effects model	R^2 for covariance fit model	X^2 for covariance fit model	Fit as covariance accepted?
Exploration	0.541	904.78	0.580	514.34	Yes
Exploitation	0.377	667.44	0.534	539.74	Yes

Table 11
The matching fit test for actualized HITA (China Sample).

Dep. variable *(Y)*	Constant term (a_0)	Organizational courage (a_1X)	HITA (a_2Z)	Absolute difference (a_3|X-Z|)	Matching fit accepted?
Exploration	0.033 (0.55)	0.371 (10.02)***	0.616 (14.00)***	−0.053 (−0.98)	Yes
Exploitation	−0.076 (−1.50)	0.309 (10.03)***	0.591 (16.14)***	0.024 (0.60)	Yes

Note: *t*-values are in parentheses; *$p < 0.05$; **$p < 0.01$; ***$p < 0.000$.

Table 12
Test of the effects of actualized HITA on exploration and exploitation (China Sample).

Relationship	Coef.	t-value	*p*
Actualized HITA → Exploration	0.717	24.99	0.000
Actualized HITA → Exploitation	0.347	5.29	0.000
Exploitation → Exploration	0.506	7.65	0.000

$X^2_{(18)} = 34.378$; RMSEA = 0.059; CFI = 0.989; TLI = 0.983; SRMR = 0.032; CD = 0.980.
$R^2_{(Exploration)} = 0.677$; $R^2_{(Exploitation)} = 0.140$.

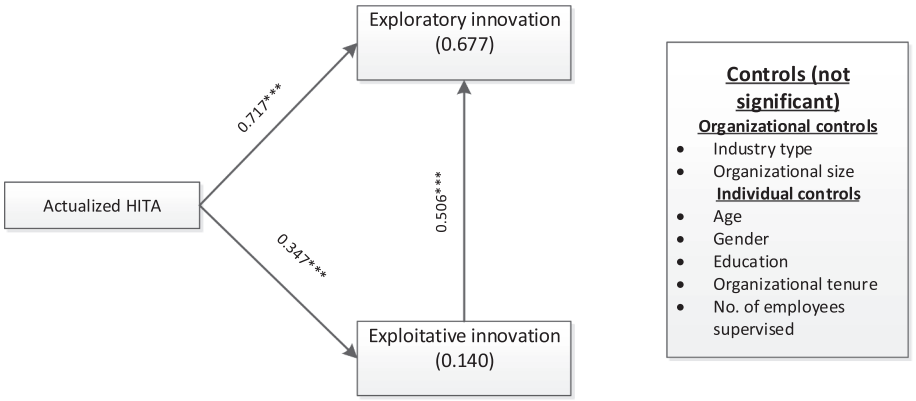

Fig. 3. Summary of final model test (Chinese sample).

(exploratory) innovation.

Finally, our model holds across the two studies, conducted in two different countries. This provides further support for the generalizability of our theory and we believe that this is because the fundamental antecedents in our model—IT affordances and courage—and how we operationalize and measure them may be neutral to cultural differences. Moreover, innovation is hugely important in both the US and China. Because we do not theorize about cultural differences, we were careful to conceptualize and operationalize variables in a way that does not tie them to a specific culture. This also helps make the study more generalizable. Thus, the wording of the items had no reference to any cultural artifact. For example, the concept and measurement of IT affordances are quite universal and does not have anything specific to either China or the US. Again, the concept of courage, which could be perceived differently in US vs China, is measured as boldness and risk taking. Arguably, both in China and US, professionals perceive that boldness and risk-taking (courage) are crucial to innovation. Whereas US and Chinese organizations may achieve boldness and risk-taking through varying mechanisms influenced by their respective cultures, both ascribe importance to the fact that boldness and risk-taking is crucial in innovation contexts.

Further contributions and implications

In their seminal article, Corley and Gioia (2011), discuss what constitutes a substantial theoretical contribution. They establish that a strong theoretical contribution can be primarily discerned in terms of revelatory insights and scientific usefulness. In addition,

a good theoretical contribution should have practical usefulness. We structure our contribution section around these ideas.

Revelatory insights and scientific usefulness of our study

The first insight is in connecting affordances and courage in the study of innovation to promote a more holistic view, where IT aligns with human agency (courage) to produce innovation. It is also notable that our paper investigates two different kinds of fit: covariance fit (i.e., IT affordances conceptualized as HITA) and matching fit (i.e., between courage and HITA). Typically, innovation research considers fit only as a first-order construct, often operationalized as mediation or moderation. By combining two different types of fit, we address the complex interplay of technology, organizational variables, and innovation. Our research shows that if *IT affordances do not align and if organizational courage is not a powerful contingency, it is difficult to achieve innovation using IT*. This is a novel insight beyond what is known in the existing literature.

Our second revelatory insight is in demonstrating that innovation requires a match between organizational courage and HITA. Conceiving and operationalizing this match-based fit is a novel way to conceptualize actualization. Many of the existing actualization studies have taken a qualitative approach; in contrast, we present a quantitative empirical technique to capture actualization. On a related note, we reveal courage as a key construct, the role of which has often escaped scrutiny in the prior innovation literature. We theoretically and empirically reveal the implications of organizational courage—such as actualization and its role as a powerful form of human agency that can prepare organizations for successful outcomes such as innovation.

Third, our study shows that the notion of coalignment/convergence (Tilson et al., 2010), is crucial to the development of an IT-based innovation ecosystem, where digital convergence stimulates innovation by increasing the heterogeneity of organizational resources and tools (Lyytinen et al., 2016). The IT affordances we discuss—collaboration, organizational memory, and process management—are different, yet coalign to provide an overall technology platform (the superordinate affordance HITA) in the organization that serves as a base for the innovation ecosystem (Wareham et al., 2014). Essentially, our results highlight how harmony (alignment) between organizational components results in increased IT value in terms of outcomes such as innovation (Roberts et al., 2012). Thus, if IT affordances do not harmoniously align, an organization will have difficulty innovating, thus partially explaining why over 90% of organizational innovations fail (Kleis et al., 2012). Through this unique conception of coaligning affordances, we provide a revealing insight into the contingent relationship between IT and Innovation.

Practical usefulness of our study

Two important practical implications arise from our work. One is highlighting the relevance of convergence or fit as a fundamental driver of innovation in organizations. To build an innovation ecosystem, organizations should invest in IT driven by a philosophy of convergence—as showcased by the salience of HITA to innovation. Perhaps one of the best ways to accomplish this is to make sure that the organization invests in IT systems that are well-integrated and complementary, so that they provide a convergent platform for organizational functioning (Wareham et al., 2014).

The second important practical implication results from highlighting that organizational courage is a salient factor in innovation. Therefore, organizations should take steps in building a collectively resilient and courageous organization that encourages boldness and risk-taking and should actively promote policies and practices that encourage these behaviors. Moreover, the buildup should start from the leaders, who should embrace the principles of courageous leadership such that they inspire the organization as well.

Limitations and future research

One limitation of our research is our use of a cross-sectional survey, which helps to improve generalizability, but can lead to issues with establishing causality (Gray and Meister, 2004). However, given that the literature on IT and organizational innovation is relatively mature, a survey approach can be found suitable (Malhotra and Grover, 1998). Of course, there is a need to extend our findings through additional techniques such as longitudinal surveys and qualitative field studies. Further, establishing generalizability requires additional studies in different contexts; for example, emerging economies such as India or countries in Latin America could be fruitful areas of investigation.

Our study reveals another fruitful direction for future research. Although we did not find any cultural differences in our results, we still cannot rule out the possibility of other forms of cultural differences. For example, we believe that differences could arise in the implementation of boldness and risk-taking in China as compared to the US. One contributing cultural factor could be the power distance differences between US and Chinese cultures. *Power distance* is a national culture construct that indicates the degree to which people in a culture accept unequal distribution of power; the US is a low power-distance culture (low acceptance of this distance) and China is a high power-distance culture (Hofstede, 2001; Lowry et al., 2011). Top-down management is more common and more expected in high power-distance national cultures. Therefore, the path to achieving boldness and risk-taking in an organization may be different between US and China.

This cultural difference as to how boldness and risk-taking are achieved in China as compared to US can also be investigated using the concept of Guanxi (Ou et al., 2014). *Guanxi* is an “intricate and pervasive relational network that contains implicit mutual obligations, assurances, and understanding” (Park and Luo, 2001, p. 455). The relational focus in Guanxi could influence the mechanism by which risk-taking and bold decision-making is achieved in Chinese organizations, especially compared to US, where such relational networks are not systematically ingrained in the culture (Chatterjee et al., 2015). We urge future interdisciplinary research to consider and investigate this possibility.

Another opportunity for future research is to use our theory to investigate other organizational outcomes, such as operational efficiency. Is the fit perspective presented in our theory a good lens through which to investigate such operational outcomes? The

results would likely highlight idiosyncrasies of the innovation environment vis-à-vis the operational environment and the attributes of organizations and IT needed to support one or the other. Finally, future research should investigate other organizational contingencies beyond courage.

Conclusion

In this paper, we theorized that organizational innovation is influenced by the fit between organizational courage and HITA (which reflects a coalignment of the three major IT affordances in an organization—collaborative affordance, organizational memory affordance, and process management affordance). We used advanced analysis techniques to test this theory and we did so in both US and Chinese contexts. The overall similarity of the results provided strong support for the generalizability of our theory and suggested that the use of advanced methods for studying IT innovation is promising. We concluded by suggesting opportunities for further research.

Appendix A. Instrument details

Construct and Source(s)	Prompt and Items	Loading	t value
Organizational courage	**"My organization…"**	0.819	40.13***
Adopted from Chatterjee et al. (2015)	…often makes bold decisions		
	…is willing to take a chance on a good idea	0.860	45.35***
	…takes calculated risks	0.702	24.33***
	…occasionally takes big risks	0.701	18.51***
IT affordance: Process management affordance	**"In my organization, IT helps manage business processes in the following ways:"**	0.798	43.69***
	Adequately visualize and monitor business processes.		
Adopted from Chatterjee et al. (2015)	Accurately provide information to support business processes.	0.867	63.48***
	Effectively streamline workflows related to business processes.	0.862	61.97***
	Support task/resource allocation, prioritization, and scheduling in order to sustain business processes.	0.836	52.95***
IT affordance: Organizational memory affordance	**"In my organization IT is used to store, access, and disseminate information as follows:"**	0.840	54.42***
	Effective capture and compilation of project information		
Adopted from Chatterjee et al. (2015)	Effective capture and reuse of project history (e.g., discussions, insights, work data, documents)	0.852	58.20***
	Effective storage, archival, retrieval, share, and reuse of project information and best practices	0.856	59.89***
	Creation of knowledge communities (e.g., virtual discussion forums) focused on new ideas	0.735	32.77***
IT affordance: Collaborative affordance	**"In my organization, IT facilitates intra-organizational collaboration as follows:"**	0.901	93.04***
	Effectively implement collaboration within the organization		
Adopted from Chatterjee et al. (2015)	Effectively manipulate the format of collaborative contributions	0.925	118.30***
	Effectively achieve synchronous, real-time collaborative work	0.918	109.99***
	Effectively enable organizational members to work collaboratively	0.923	115.16***
Innovation: Exploratory	**Indicate how inventive your organization is:**	0.846	54.41***
	My organization accepts demands that go beyond existing products and/or services.		
Adapted from Jansen et al. (2006)	My organization invents new products and/or services.	0.856	56.56***
	My organization experiments with new products and/or services.	0.852	56.54***
	My organization commercializes products and/or services that are completely new to the organization.	0.787	41.49***
Innovation: Exploitative	**Indicate how well your organization uses its existing resources, practices, knowledge, etc.:**	0.803	45.09***
	My organization frequently refines the provision of existing products and/or services.		
Adapted from Jansen et al. (2006)	My organization regularly implements small adaptations to existing products and/or services.	0.797	44.02***
	My organization regularly enhances its existing products and/or services.	0.875	64.90***
	My organization enhances its existing products and/or services on a regular basis.	0.827	50.62***

Note: All items used a Likert-type scale from 1 (Strongly Disagree) to 7 (Strongly Agree).

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