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Article

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MANAGEMENT | RESEARCH ARTICLE

Innovation process model: An integration of innovation costs, benefits and core competence

Asiamah Yeboah^{1*}

Abstract: Innovation has been cited as the single most critical source of competitive advantage and enables firms to respond creatively to competitive threats and opportunities. That notwithstanding, innovation process has not been well developed and understood. This study aims at addressing this gap by scrutinizing four questions: (1) What costs need to be considered in innovation? (2) Under which innovation process model are the costs considered? (3) What benefits are available? and (4) What competencies are required for innovation? Answers to these questions will provide a valuable insight and a better understanding for successful innovation process. To achieve this, the paper proposes a framework to integratively map innovation stages, costs, benefits, and core competence for successful innovation to build sustainable competitive advantage. This study submits that until the costs, benefits and competencies for innovation are considered integratively, and mapped onto innovation stages, innovation and competitive advantage will suffer the consequence thereof.

Subjects: Technology; Finance; Business, Management and Accounting

Keywords: innovation; costs; benefits; core competence; competitive advantage

1. Introduction

As business environment becomes more complex (Burgelman & Madique, 1988; Hax & Wilde II, 1999; Hayes & Abernathy, 1982; H. I. Ansoff, 1979) and the traditional means of growth crumbles (Capon & Glazer, 1987), innovation has been cited as the single most critical source of competitive advantage Van de (1986) which enables firms to respond creatively to competitive threats and opportunities (Drucker, 1985). Innovation changes the dynamics of the marketplace and favours the innovator when current products and services become noncompetitive (Dickson, 1992). Innovation uncontestedly contributes directly to long-term profitability by enabling firms to build sustainable competitive advantage (Palmer et al., 2001). However, innovation can also be risky (R. Calantone et al., 1994; Conner, 1995; Friar, 1995), because it is costly than expected (Palmer et al., 2001), with no guarantee of adequate success (Leavitt, 1986). Additionally, the theories of innovation allow only a limited intelligence to forecast whether innovation will unquestionably profit the firm (Abrahamson, 1991).

However, McGrath et al. (1996) posit that firms must create distinctive competitive advantage to avoid leakage or imitation to benefit from innovation. The authors further assert that for innovation to create competitive advantage, it must demonstrate successful and dependable achievement of business objective, to suggest that it has created a new “competence” (p. 389). This assertion is true because competitive advantage is not dependent on market and industry’s structural characteristics, but depends on superior internal resource (Kumlu, 2014; Soh, 2005), and inimitable skills and abilities (Aziza & Samad, 2016; Hana, 2013).

Undoubtedly, innovation is a source of competitive advantage and contributes directly to enhanced performance but may involve extraordinary risk (R. Calantone et al., 1994; Conner, 1995; Dickson, 1992) and may lead to a waste of resource (e.g., Covin & Slevin, 1989). Therefore, firms must be extremely careful and get their strategy right when embarking on any innovation journey. As a result of the risky and costly nature of innovation, firms must have a deeper understand of the process. Thus, the stages involved, costs, benefits, and the competencies required for successful innovation. This is because prior studies have confirmed core competencies as key driver of innovation (Francois et al., 2002; Rittera & Gemünden, 2003; Talke et al., 2006), and as the foundation of firms' competitiveness (Pralhalad & Gary, 1990). Additionally, innovation is also unlikely to occur without the existing core competencies of the firm, and with no benefits anticipated. Despite this insight, previous studies have studied innovation cost (Craighead et al., 2009; Bunduchi & Smart, 2010; Zhu et al., 2006; Irani & Love, 2000/2001, 2001), benefits (Chwelos, Benbasat et al., 2001a; Iacovou et al., 1995; Mukhopadhyay et al., 1995) and core competencies Prahalad & Gary, 1990; Alexander & Martin, 2013; Yang, 2015) in isolation. Thus, there is a lack of studies systematically integrating these variables (innovation costs, benefits, and core competence) thereby, creating a gap in knowledge. Furthermore, because innovation costs, innovation benefits, and core competencies are complex issues and characterized by low levels of understanding, the more they are examined integratively, the more easily they can be understood and applied by managers (Özbağ & O., 2015). There is therefore an urgent need for this study to bridge the gap between theory and practice. Consequently, this paper aims at filling the void in knowledge by developing an integrated model of innovation costs, benefits, and core competencies to provide a better understanding of the innovation process.

This paper seeks to address the gap in literature by asking (1) What costs need to be considered in innovation? (2) Under which innovation process model are costs considered? (3) What benefits are available? and (4) What competencies are required for innovation? These questions are being asked because they confront the claims that innovation is unquestionably positively related to competitive advantage. Although, the literature on innovation gravitates towards innovation as positively related to competitive advantage, an economic perspective assuages that assertion for several reasons (Mahnke, 1998). First, to innovate successfully for sustainable competitive advantage, the necessary conditions for innovation must be established. Second, the likely benefits of innovation must be identified in relation to associated costs incurred. Thirdly, the competencies or skills required for innovation at the various stages must be identified and costed. To chart a new path, this paper submits that until innovation costs and competencies required are identified and budgeted appropriately, related benefits will suffer rather than improving competitive advantage.

This study adds to progressing a better understanding of the relationship between innovation and competitive advantage over time by clarifying the relationship between innovation, core competence and competitive advantage. It will also inure to the benefit of managers and practitioners as it will help to clarify the costs and benefits of innovation, together with the competencies required to avoid any confusion and develop innovation to ensure competitive advantage.

The paper proceeds as follows. The next section covers the research methodology. It is followed by literature review (innovation, innovation process, innovation process model, and core competence, innovation costs, benefits, and core competence) mapping onto innovation stages. The proposed model in the study will then follow. The next section will be the conclusion and implications for theory and practice. The final sections of the paper will be limitations and suggestion for future research.

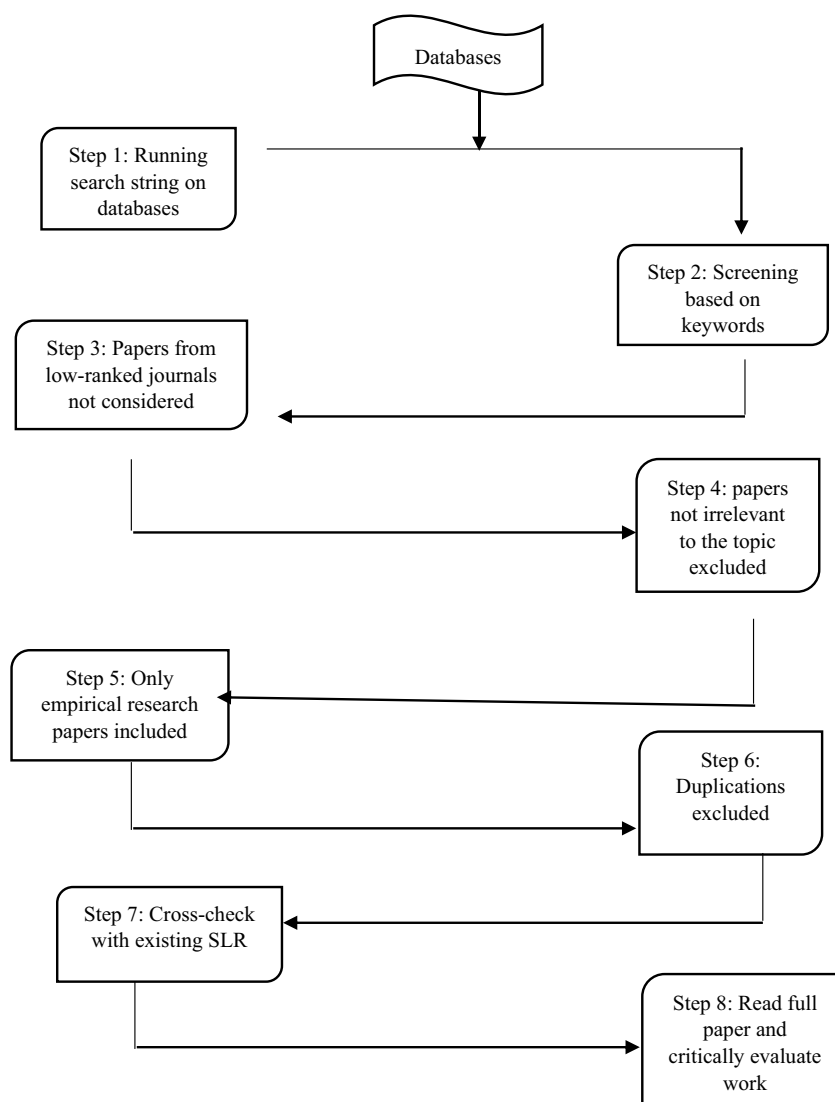
2. Research methodology

In terms of research method, this paper followed a document analysis of multidisciplinary innovation process-focused literature (Beausoleil, 2018). This method offered a standardized approach for reviewing, examining and interpreting literature. The method used has been widely utilized in qualitative research by finding, choosing, connecting, and incorporating data in literature (Yin, 1994). The conceptual framework presented in this paper has drawn on literature from different areas of innovation and different fields such as management theory, strategic management, decision sciences, and

organizational behavior. This research method has been utilized with the aim of bringing out meaning, discerning, and building empirical knowledge and intelligence from the related data (Corbin & Strauss, 2008; Bowen et al., 2010). The various fields of study have been identified through a search of scholarly literature available primarily through electronic databases (Ipe, 2003). Basically, this conceptual paper started with finding, selecting, and examining publications that discussed the concept of innovation process theories and model literature across multiple disciplines. The initial expansive review of relevant literature was followed by the process of analysis and synthesis (Ipe, 2003). Special attention was now given to issues and ideas that focus on innovation process models, key innovation development process phases; and classifying individual innovative competencies associated with each process phase.

The review of literature indicated relevant information from different fields of study relating to innovation and innovation process development. The conceptual framework presented in this paper is an attempt to integrate all these ideas into one whole to provide a more comprehensive approach to understanding innovation process development model. The framework also introduces relationships between different issues identified from the literature. Some of these relationships are apparent in the literature (Ipe, 2003), whilst others are being introduced in this paper to further delve into the interaction

Figure 1. snapshot of the research methodology.



between the key elements that affect innovation process development model. These relationships are discussed in detail later in the articles. Figure 1 below summarises the research methodology utilized in this research.

3. Literature review

3.1. Meaning of innovation

Innovation has been defined severally in literature (Rogers, 1998), because it is broadly seen as a concept that has a wider interest from academic, business world, governments of both developed and developing countries (Bowen et al., 2010; Santos et al., 2014). Van de (1986) defines innovation as a product, service, or process that is new or perceived as new by its developers. In the knowledge-based perspective, innovation is considered as the process that helps translate ideas or inventions into marketable goods and services to produce value (Brettel & Cleven, 2011; Crossan & Apaydin, 2010; Krizaj et al., 2014). Innovation is the process of creating something new that has significant value to an individual, a group, an organization, an industry, or a society (Higgins, 1995). The author further asserts that innovation is how a firm, or an individual makes money from creativity.

Rogers (1998) defines innovation as “the application of new ideas to the products, processes or any other aspect of a firm’s activities. Innovation is concerned with the process of commercializing or extracting value from idea” (p. 5). Innovation is the application of original or essentially advanced product, or action, an advance marketing approach, or new directorial design in business practices, workplace management or extraneous affinity (OECD, 2005, p. 46). Innovation management generally encompasses knowledge required to master the initiation, development and commercialization of successful products and services Liyanage & Poon, 2003. Most innovation management research has focused on new product development processes, product innovation, product technology, pricing and market adoption (Montoya-Weiss & Calantone, 1994; Yang & Tao, 2012).

Schumpeter defined five types of innovation (see OECD, 1997, p. 28), namely introduction of new product or a qualitative change in an existing product; process innovation new to an industry; the opening of a new market; development of new sources of supply for raw materials or other inputs; and changes in industrial organization. However, in reacting to Schumpeter, the Oslo Manual, introduced by OECD (1997, 2nd edition) chose the first two types of innovation to clarify because it thought that those two are easy to define and measure (Rogers, 1998). The two are as follows: technological product innovation and technological process innovation. A technological product innovation can involve either a new or improved product whose features differ substantially from previous products. The difference in characteristics is attributable to the use of new technologies, knowledge, or materials. On the other hand, a technological process innovation is the adoption of “new or significantly improved production methods, including methods of product delivery” (OECD, 1997, p. 49). In both cases, the words “new” or “improved” is used. Meaning that innovation could be the creation of something new or diffusion of existing knowledge.

3.2. Innovation process

The innovation process as an observable and reproducible process of human imitation was first portrayed by Gabriel Tarde (1903). Tarde painted how individuals and societies copy behaviours of others, recombining their own values and desires, and express them in new forms. In a related development, Cooper (2001) postulated that NASA’s space program in the USA was one of the pioneers in implementing a product development process during the 1960s.

These first-generation processes were largely engineering driven and more a measurement and control tool. Most of the innovation process models implemented today are second generation models, which usually involve six required steps for managing the process

effectively and transforming new ideas into new products or services. (Ottenbacher & Harrington, 2007, p. 5)

Innovation development process has been defined differently by several authors in different context at different times. Cooper and Edgett (1999) define innovation development process as a formal blueprint, roadmap or thought process for driving a new project from the idea stage through to market launch and beyond. Van de Ven et al. (1999) define the innovation process as a facilitated approach to creativity, and successful management of the complex process of turning creative ideas into reality. These process models, when applied in a disciplined manner, enables firms to enhance effectiveness and efficiency of innovations so that the scarce resources of the firm are not wasted (Trott, 2005). The innovation process is the development, adaptation and implementation of an idea that is useful and new to the organization at the time of adoption (Amabile & Gryskiewicz, 1987; Damanpour & Schneider, 2006). Christensen (1997) relates the innovation process with disruptive technologies leading to disruptive innovations whilst Schumpeter (1934) posited that the innovation process involves a science-push and problem-solving methodology and is focused on tangible products and processes that can be measured economically.

However, the use of development process models does not necessarily guarantee success but enhance the opportunity for success (Cooper, 2001).

3.3. Innovation process models

The innovation process models are crucial to understand, because they simplify the innovation process into a series of phases and stage-based activities, each with a unique set of tasks, associated skills and roles. The first visual model of the innovation process is credited to rural sociologist, Eugene Wilkening (1953) describes the innovation process as a proposal of a new practice (new farming technology) that requires acceptance and approval before adoption. Wilkening's process of acceptance before adoption reflects a decision-making process, through which learning, decision and action occur over a period. He offers a four-stage process that includes (1) initial knowledge; (2) acceptance of practice as a good idea; (3) acceptance of the practice as trial; and (4) adoption of the practice (Wilkening, 1953, p. 9). Generally, the innovation process models include two common phases that each involves numerous and varying sub-stages.

Although several scholars argue that there is not one universal (one size fits all) or same order of steps to the innovation process, most agree on four key activities, those involving the initial vision or input, idea generation, innovation development, and implementation or output (Amabile, 1988, p. 151). Rice and Rogers (1980) categorized innovation scholars into two: Latter and former. The authors assert that the latter scholars acknowledged several substages of implementation, whereas the former scholars generally conceived of the process as ending with the decision to adopt. "The process of adopting (and, at some stages, rejecting) an innovation is conceptualized as a sequence of subprocesses in which the innovation moves from a general concept to its expression as a specific set of organizational behaviors" (Rice & Rogers, 1980, p. 500). The authors proposed a five-stage model of the innovation process in organizations after studying innovation process model introduced by other scholars. Their five-stage model includes

(1) Agenda-setting: the stage at which the general problems of an organization are defined (or imposed by regulation) and commonly recognized by its members.

(2) Matching: the stage at which a general problem from the agenda and a possible solution are brought together (within an organization or through intergovernmental programs).

(3) Redefining: the stage at which the main attributes of the innovation are defined in terms relevant to members and goals of the organization.

(4) Structuring: the stage at which organization members establish the innovation within the structure of the organization.

(5) Interconnecting: the stage at which the innovation-organization structure defines its relationships with the rest of the organization and external forces. The conclusion to the innovation process occurs when the innovation becomes a normal, routine part of the system (p. 500).

Van de Ven et al. (1999) postulate the innovation process is comprised of three phases: (1) an initiation period consisted of events that set the stage for launching the efforts of developing the innovation; (2) a developmental period consisted of activities and efforts undertaken to transform the innovation idea into a concrete reality; and (3) an implementation period which comprises innovation adopted as a new program, product or business or terminated and abandoned. Their framework reflects the common elements empirically derived from his studies of the innovation journey (Beausoleil, 2018). Ottenbacher and Harrington (2007) argue that innovation process models tend to follow the format of the Booz, Allen and Hamilton (1982) model and Urban and Hauser (1993). According to the authors, these models consist of the following six steps:

1. Idea Generation
2. Screening
3. Business Analysis
4. Concept Development
5. Final Testing
6. Commercialization

Several scholars such as (e.g., Rogers, 1993, 1962; Zaltman & Holbeck, 1973) have backed two-stage model: (1) an initiation stage, which consists of “all activities connected with problem perception, information gathering, attitude formation and evaluation, and resource attainment leading to the decision to adopt”; and (2) an implementation stage which consists of “all events and actions pertaining to modifications to the innovation and/or organization, initial utilization, and continued use or discontinued use (Damanpour, 1991, p. 562).

Some researchers have also viewed innovation as a three-stage innovation process: generation, acceptance, and implementation (Pierce & Delbecq, 1977; Thompson, 1965). This three-stage model distinguishes between the generation of an innovative idea, the acceptance of an innovation as described by an organizational authorization for change, and the implementation of the innovation such that it becomes rooted within the organizational behaviour (Bunduchi & Smart, 2010). Successive innovation research has developed this pioneering three-stage model, and while other stages have been introduced, they can readily be mapped onto Thompson’s original three-stage model (Damanpour & Schneider, 2006). Moreover, the three-stage model of organizational innovation proposed by Thompson (1965) is generally regarded in the innovation literature as the most evocative and theoretically straightforward of the innovation models (Damanpour & Schneider, 2006; Kwon & Zmud, 1987; Pierce & Delbecq, 1977; Swanson 1994; Zmud 1982). Other remarkable innovation process models in the literature include Utterback and Abernathy dynamic product to process innovation models (1975, 1978); Roberts and Fusfeld’s five (1981) critical functions model; Tidd and Bessant’s four-action model (2001); Kumar’s (2013) seven-modes design model; and Rogers (1962) innovation development and diffusion of innovation models.

Although several innovation process models have been identified in literature, the choice of any model is voluntary and cannot be forced on any organization. The decision to adopt a particular model is a strategic one by considering different internal and external factors. Some of the internal factors that influence the choice of innovation process model include the strategic direction of the firm, top management preference and functional skills, general resources and assets condition available, the type of innovation, employees' knowledge, skills and attitudes and innovation culture reflected in the organizational values. Externally, customer requirements and activities, labour market conditions, legal and regulatory issues, competitors and suppliers and the supply of technological and other types of knowledge valuable to innovation, all affect the choice of the innovation process model. One unique factor that can be both internal and external is the cost involved. This according to Bunduchi et al. (2010) has been notably absent from these discussions. Essentially, all the internal and external factors are important determinants for the adoption of innovation process model. However, this paper submits that without special mentioning of the type of firm in this discussion, the narration will not be complete. This stems from the fact that organizations differ in their character, context, and market, therefore what influence for example, manufacturing or service, large or small, public, or private may be different and will require different attention. Thus

Proposition 1: *Firms are likely to be successful in their innovation only when proper mechanisms are put in place to ensure that the organization's specific context and the suitability of the innovation type are well-connected, costs and benefits identified and appropriated, and the relevant stages involved in the process together with the competence required are mapped onto appropriate framework.*

4. Innovation costs, benefits and core competences

In trying to exploit conceivable economies of innovation, not only the potential benefits need to be fashioned out and appreciated. Important investments and the costs of innovation together with the competencies required usefully enter the agenda. The process of organizational innovation is shaped by both innovation costs, innovation benefits (Bunduchi & Smart, 2010) and the competencies required for innovation. "The costs organizations incur during the adoption of process innovations in general, and interorganizational process innovations in particular, play a significant role in the likelihood of adoption" (Smart and Bunduchi, 2010, p. 425). Mansfield (1993) posits that the perceived net benefit offered by an innovation has been shown to influence organizational innovation. While the net benefit unquestionably includes innovation costs, most research have concentrated on clarifying the different types of benefits (Johnston & Vitale, 1988). Undoubtedly, all innovation activities are subject to forces which give rise to cost consciousness. However, whilst the costs of innovation have been increasing because of higher costs for personnel, equipment, regulations and testing, profits have decreased for most firms over the past few years (Shields & Young, 1994).

4.1. Innovation costs

The innovation cost is usually regarded as a sub-set of innovation activities (Rogers, 1998). The ABS Innovation Survey (1994) defines innovation cost as equal to the sum of expenditures on research and development (R&D), acquisition of technology, training related to new or changed products or processes, tooling-up (ditto), and marketing of new products. From the pharmaceutical industry perspective, Pisano (1997) defines the process innovation development cost as "the total number of hours spent by scientists and engineers developing the process, from the initiation of process research to the successful validation of the process at commercial scale" (p. 147). The same definition can be applied to inter-organizational processes (Bunduchi & Smart, 2010). The definition of innovation costs provided by the authors in literature recognises in-house innovation as well as innovation acquired from outside. This implies that, all the activities that an organization goes through from the start to the end of the innovation process must be accounted for.

While some researchers have looked at innovation cost as a single, high-level variable such as the “financial costs of developing and implementing” (Chwelos, Benbasat et al., 2001a), others have focus simply on “the costs of implementation” (Linton, 2002). Attewell (1992) examines the cost of equipment, whilst Farrell and Shapiro (1988) focus on switching costs. There are some few studies that have tried to specially distinguish between categories of costs related with innovation adoption (Premkumar et al., 1994; Zhu et al., 2006). Different classification of innovation cost has been identified in literature including cost of capital (McFarlan, 1981; Smith et al., 2001; Soliman & Janz, 2004), development cost (Antonelli, 1994; Farrell & Saloner, 1988; Gupta et al., 2008), direct and indirect cost (Baldwin & Lin, 2002; Fitzgerald 1998; Ryan & Harrison, 2000), relational cost (Soliman & Janz, 2004; Meier, 1995; NakayaMa, 2000), and switching cost (Forman, 2005; Klemperer, 1995; Tang & Zannetos, 1992; Zhu et al., 2006).

Meanwhile, this paper does not want to hurriedly join the classification of innovation cost and benefit debate without critically scrutinizing the innovation approach. Thus, any attempt to outline the costs and benefits of innovation without linking it to the approach utilized, will not be appropriate and reliable. By innovation approach, I mean whether innovation takes place within the organization (in-house) or ideas are imported from external source (acquisition). The other essential consideration is that, is the innovation undertaken and sponsored by a single organization or multiple organizations through collaboration? This knowledge is necessary because the costs and benefits that manifest in the approaches identified will differ in terms of their nature and magnitude. For example, one would expect collaborative innovations to be cheaper because it is owned by multiple organizations, who share the costs and reaped the benefits accruing from their use. Contrary to this assertion, Foray (1994) posits that innovations in collaborative settings are costly in terms of both the time and the human resources required to participate in. Additionally, being part of consortium involves the payment of a membership fee (Gupta et al., 2008), and the participants have vested interests in incompatible outcomes from the innovation process, which can lead to further expense (Bunduchi & Smart, 2010). On the other hand, acquiring innovation from outside saves the organization the cost of development, and potentially speeds up implementation (Gopalakrishnan & Bierly, 2001). The costs to the acquirer at the generation stage result from activities focused on gaining awareness of an innovation rather than on being involved in the technical development activities (Bunduchi & Smart, 2010).

However, one important thing that is noticed about innovation costs is that they manifest mainly in one of the three identified stages adapted from Thompson (1965) (generation, acceptance, and execution stages) but not exclusive to that stage. For instance, the cost of capital emerges during the acceptance stage, when the organization is looking for capital to invest in new technology, but it can extend well into the implementation stage (Bunduchi & Smart, 2010). They also depend on the innovation approach, thus, whether the innovation is in-house or acquired from external source. This is specifically related to the generation stage. Again, innovation costs differ in nature and quantum across the various stages. This stems from the fact that different stages require different activities and different set of competence; therefore, the costs involved may not necessarily be the same.

For example, this paper identified design costs and acquisition costs at the generation stage. The design costs relate to the costs of all the activities by which innovation is developed within an organization and include (R&D) expenditures, engineering expenditures, manufacturing start-up cost, tooling-up cost, incentive for idea generation, compensation for time spent working on ideas, external development cost and consortium fees (development outside with collaborators) whilst Acquisition costs are incurred by organizations that acquire ideas from external developers and may include (patents and licenses costs, consultancy fees and the expenditures) incurred in integrating the new technology or system into the organization's existing system, including expenditures of the workshops, seminars, intranets, social media (LinkedIn, Instagram, Snapchat, WatsApp, etc.).

The approval stage also identified two types of cost: the production costs and the set—up costs. These costs include the investments in providing infrastructure, non-trivial set-up costs that include technology investments, consultancy fees, re-organization costs, and time required from managers and other employees (Meyer & Goes, 1988). Thus, all the necessary costs involved in switching from the old system to the new process and system and the cost of associated risks such as financial risk, security risk, political risk, technical risk, incompatibility risk (Forman, 2005; Klemperer, 1995). Most of the costs associated with this stage is mainly fixed cost in nature.

Finally, two types of cost were identified at the execution stage: organizational costs and regulation costs. Organizational costs cover all the transactions within (internal transaction) agency costs, and incentives related to internal activities to train and equip the staff on-the-job employee training and management time (Chatterjee et al., 2002; Damanpour & Schneider, 2006). This together with branding, packaging and communication form the organizational costs. Regulation costs cover all the cost incur by the organization to legalize ownership of innovation and its operations. This includes payment of fees and charges to governmental bodies and agencies including environmental, health, safety, legal, patent, and intellectual property rights or ownership right (Shields & Young, 1994).

Shields and Young (1994) assert that other determinants such as top management attention to costs and organizational culture are critical in determining innovation costs. Citing example to support the assertion, the authors argue that if costs are not an important part of the firm's competitive strategy, it is quite likely that their importance will be downplayed and focus on other variables such as technical innovation, quality, and speed to market. However, if top management appears to be committed to cost management, the organization will be more inclined to give costs a higher priority when they make decisions about tradeoffs among key variables such as innovation, quality and time to market. Thus

Proposition 2: *Organizations are more likely to underestimate innovation costs and suffer the consequence thereof, if they fail to capture all the innovation activities at every stage of the process, and cost appropriately together with other determinants of costs.*

4.2. Innovation benefits

The key output measure of innovative activity is the success of the firm (Rogers, 1998). The author further assert that a firm's success can be represented by profit, revenue growth, share performance, market capitalization or productivity. In 1993, Rogers viewed innovation benefit as relative advantage and defined relative advantage as the degree in which an innovation was perceived as an improvement on the idea it replaced. The author posits that there are five factors affecting the spread of an innovation: relative advantage, complexity, compatibility, observability and opportunity for trying it out. However, in 1998, Rogers assert that an unconventional measure of innovativeness output is to create variables for the number of new or improved products introduced. And added that highly innovative firms would be expected to have a higher percentage of sales from new and improved products.

On the other hand, some authors (e.g., Iacovou et al., 1995; Chwelos, Benbasat et al., 2001a; Weber and Kantamneni 2002; Jimenez-Martinez & Polo-Redondo, 2004) categorize interorganizational process innovation benefits into three: direct benefits; indirect benefits; and strategic benefits. According to the authors, direct benefits are the easiest to identify and measure; they are easily understood by all and obviously, the first to be experienced. The indirect benefits are less “tangible” and are related to improved efficiency in the firm's internal organization and changes in the relationship with suppliers and customers; in short, the way a firm can change its business methods. According to the authors, strategic benefits are closely related to indirect benefits, and are obtained thanks to the

large amount of information generated and the speed with which this information can be acquired. This gives rise to the ability to forge closer business links with customers and/or suppliers.

Another group of researchers (e.g., Cunningham and Tynan, 1993; Mukhopadhyay & Kekre, 2002; Mukhopadhyay et al., 1995; Subramani, 2004) also classify interorganizational process innovation benefits into four: first-order benefits; operational benefits; strategic; and second-order benefits. According to these authors, the first-order benefits are linked to the firm's activities but could be impacted directly by other firms. Per the authors' assessment, operational benefits are derived from lower transaction and production cost through cost savings from (e.g., personnel cost; lower transmission charges, costs for inventory holding, and obsolete inventory). The second-order benefits are competitive outcomes and incorporate the influence of external factors such as competitors moves and environmental changes that are beyond the control of an individual firm whilst strategic benefits arise through firms positioning themselves to take advantage of opportunities arising in the relationship (Bunduchi & Smart, 2010).

Different stages of innovation offer variety of benefits to the organization. However, this paper maintains that the main and most considerable benefit of innovation at the generation stage is the first mover advantage. Lieberman and Montgomery (1988) define first-mover advantage in terms of the ability of pioneering firms to earn positive economic profits (i.e., profits in excess of the cost of capital). There is anecdotal and empirical evidence demonstrating that first movers' competitive performance tended to be better than that of later entrants (Suarez & Lanzolla, 2007). The benefits enjoy by first movers include brand recognition, customer loyalty, higher market share and survive longer (Carroll et al., 1996; Klepper, 2002).

On the other hand, the major and visible benefit associated with the approval stage is operational effectiveness. Operational effectiveness refers to the ability to establish processes, based on core capabilities within the organizations, which work well (M Porter, 1996). Operational effectiveness involves improving process performance by leading and controlling the processes within the firm as well as measuring and improving the processes (Santa et al., 2009). The main operational benefits accrue to organizations are elimination of waste or cost reduction, improving quality to meet customer expectation, flexibility (ability to adjust to changes in response to customers' needs—Slack, 1991), reliability (consistently perform as expected over time—Santa et al., 2009), and improving on speed (able to shorten the time between the service request and delivery of the service), with the frequency, and at the time, that a customer request (Hill, 2005).

The biggest benefit of the execution stage of the innovation process is the strategic advantage. Strategic advantages are marketplace benefits that utilize a critical control on an organization's prospect of future success. Some authors (e.g., Arora et al., 2001; Lichtenthaler, 2005) argue that the strategic, thus, non-monetary benefits of innovation have received relatively little attention and considered secondary or complementary benefits even though they are frequently mentioned in innovation research. The strategic benefits are divided into three groups: product-oriented, technology-oriented, and mixed strategic objectives (Kutvonen, 2011). Strategic advantage includes competitive advantage, ownership right or intellectual property rights, sustained performance, cross—licensing, and building dynamic capabilities (Kutvonen, 2011; Kutvonen et al., 2010).

It is an undeniable fact that innovation offers a lot of benefits to innovative firms; however, one thing that is also clear is that the risk of imitation increases as innovation increases. Therefore, there must be strict measures in place to prevent leakage so as to preserve the benefits accrue innovation. Expectedly, the risk of imitation may be less severe because the preventive measures will not allow complete imitation. Moreover, causal ambiguity Lippman & Rumelt, 1982 and time compression diseconomies (Dierickx & Cool, 1989) may protect resource-positions from quick erosion. Despite these “isolating mechanisms”—factors “that make competitive positions stable and defensible” (Rumelt, 1984, p. 567)—limit the erosion of competitive advantage at a certain point of time, residual risk remains, and competitors may overcome these obstacles as time pass

by (Mahnke, 1998). Though, the mentioned barriers fend off competitors from swiftly imitate resource positions, the risk of imitation is lowered and not eliminated. innovation is still bare to arrogation and may help competitors to faster match or erode a given competitive position. Therefore, when companies choose to invest in innovation, they may simultaneously safeguard against the hazards of imitation through actively protecting organizational secrets (Mahnke, 1998). Thus

Proposition 3: *Different stages of the innovation process offer different benefits which cannot be enjoyed without any challenge. Organizations can reap full benefits from their innovation activities only when they are able to reduce or completely eliminate the risk of leakage and imitation*

4.3. Core competencies and innovation

“Core Competence” as a concept has been studied widely by researchers ever since its introduction by Prahalad and Hamel in the 1990s. Despite its widely acceptance among researchers, there has not been an agreement on any standard definition of core competence since, it is an umbrella term which covers resources and capabilities Özbağ & O., 2015. Competencies related to innovation are normally portrayed as knowledge-based capabilities, aptitudes and skills integrated within organizational innovation management activities and systems (Leonard-Barton, 1995; Schmitt & Chan, 1998). Competence and competency generally denote a person’s ability to understand or perform a certain task (Beausoleil, 2018). Prahalad and Gary (1990) define the core competence as the collective learning in the organization, especially the capacity to coordinate diverse production skills and integrate streams of technologies. They postulate that core competence is the engine for effective product and service innovation. Pavitt (1991) posits that organizations could profit from innovative advantage by building up their competencies, which are costly and difficult for competitors to imitate. Leonard-Barton (1995) provided four dimensions of innovation-related core competencies including (1) employee knowledge and skills (2) embedded into technical systems; the process of knowledge creation and control are guided by (3) managerial systems; and (4) the values and norms associated with various types of embodied and embedded knowledge and knowledge creation processes (p. 113). Tidd (2000) adapted Leonard-Barton’s classification to “market competencies”, grouping people’s knowledge, managerial systems, and norms together in a broader dimension to cover the organization’s ability to understand and develop markets.

Other authors such as Bartram (2005), West et al. (2006), and Du Chatenier (2009) have investigated individual factors and qualities related to innovation competence. Du Chatenier (2009) suggested a developing concept for innovation-related competence which is a work-oriented approach introduced by Delamare Le Deist and Winterton (2005). The approach developed by Le Deist and Winterton (2005) reiterates job-related functional skills, contextual knowledge, and related work-tasks. Consequently, Beausoleil (2018) developed a model that reflects Du Chatenier’s model for open innovation competence (2009:22) as well as Van Dam et al. (2010) model and maps innovative competencies to the proposed normative framework of Rogers’ innovation development process. Beausoleil’s model reflects three categories of innovativeness competencies: knowledge, aptitudes, and skills.

This paper submits that it is important for the employees and top management to have certain key competence to support the generation stage. For example, to effectively integrate or create awareness of the new technology, process or system develop or acquired requires effective communication skills. Thus, the ability to listen and speak effectively, present ideas appropriately, and write clearly and concisely (Beausoleil, 2018). On the other hand, the skills necessary to support idea generation and design within include critical thinking, creative thinking, visual thinking, problem identification, design thinking, and decision-making. In addition to the above general skills, top management must be active listeners, have patience, be dependable, give effective feedback and develop their team to support innovation in their firms.

Table 1. A summary of literature on innovation process model, cost, benefits, and competencies

Authors	Year	Issues	Trends
Amabile	1988	Sequence of steps to innovation process	Four key activities: initial vision, idea generation, innovation development, and implementation
Rogers	1983	Steps to innovation process	Two activities: initiation and implementation stages
Staw	1990	Innovation process steps	Two activities: initiation and implementation stages
Van de Ven et al.	1999	Innovation process	Three phases: initiation period, developmental period, and implementation period
Wilkening	1953	Innovation process model	Four-stage process: initial knowledge; acceptance of practice as a good idea; acceptance of the practice as trial; and adoption of the practice
Rice and Rogers	1980	Innovation process model	Five-stage process: agenda setting; matching; redefining; structuring; and interconnecting
Ottenbacher and Harrington	2007	Innovation process model	Six-step model: idea generation; idea screening; business analysis; concept development; final testing; and commercialization
Thompson	1965	Innovation process model	Three-stage model: generation; acceptance; and implementation
UK Design Council	2005	Innovation design	Four-stage model: discover; define; develop; and deliver
Brown	2009	Innovation model	Three-stage model: inspiration; ideation; and implementation
Quayle	2009	Innovation process model	Three-stage model: ask; try; and do
Kumar	2013	Innovation model	Seven-stage mode: sense intent; know context; know people; frame insights; explore concepts; frame solutions; realize offering
Allen et al.	2000	Innovation adoption costs	Relational costs
Chau and Tam	1997	Innovation adoption costs	Implementation costs (indirect costs)
Farrell and Saloner	1988	Innovation adoption costs	Development costs and Switching costs
Zhu et al.	2006	Innovation adoption costs	Switching costs and implementation costs (direct and indirect costs)

(Continued)

Authors	Year	Issues	Trends
Smith et al.	2001	Innovation costs	Cost of capital
Soliman and Janz	2004	Innovation costs	Cost of capital and relational costs
Markus	2000	Innovation costs	Cost of capital
Ryan and Harrison	2000	Innovation costs	Direct costs and ndirect costs
Chwelos et al.	2001	Innovation costs	Implementation costs
Bunduchi and Smart	2010	Innovation process costs	Internal and external development costs; initiation costs; switching costs; costs of capital; direct and indirect implementation costs; relational costs
Iacovou et al.	1995	Benefits associated with process innovation	Direct benefit; Indirect benefits; and strategic benefits
Chwelos et al.	2001	Benefits associated with process innovation	Direct benefit; indirect benefits; and strategic benefits
Weber and Kantamneni	2002	Benefits associated with process innovation	Direct benefit; indirect benefits; and strategic benefits
Jimenez—Martinez and Polo-Redondo	2004	Benefits associated with process innovation	Direct benefit; indirect benefits; and strategic benefits
Murhopadhyay and Kekre	2002	Innovation benefits	Operational benefits; second-order benefits, first-order benefits; strategic benefits
Subramani	2004	Innovation benefits	First-order benefit; second-order benefits; operational benefits; strategic benefits
Schmitt and Chan	1998	Innovation-related competencies	Knowledge-based capabilities; aptitudes; and skills
Beausoleil	2018	Innovation competencies	Knowledge; aptitudes; and skills
Le Deist and Winterton	2005	Innovation-related competencies	Job-related functional skills; contextual knowledge;; and related work-tasks.
Leonard-Barton	1995	Innovative competencies	Four dimensions: employees knowledge and skills; embedded into technical systems; managerial systems; and the values and norms

Much the same way, the competence required at the approval stage includes project management and operations management skills to successfully manage the various projects and operations associated with this stage. Other skills include market intelligence, creative thinking, and communication skills. Top management should be able to explain the organizational goals, policies and specific tasks clearly and succinctly to employees.

The execution stage basically deals with strategies to develop and grow the business. This includes building relationship with key stakeholders. Marketing and distribution take the centre stage. Here the organization must design and implement market development and communication strategies to achieve market growth and development. Therefore, the competence/skills needed to support this stage include business analysis, reflective thinking, communication, marketing (designing and packaging) and project management.

Several researchers have underscored the relationship between competences and innovation and indicate that a firm's core competencies enhance its ability to innovate (Özbağ & O., 2015). For instance, Zirger and Maidique (1990) found out that two of the five most important factors affecting product innovations are the product's value to the customer and the synergy of the new product with the firm's existing competencies. Several studies (e.g., Cooper & De Brentani, 1991; Cooper & Kleinschmidt, 1993; Kleinschmidt & Cooper, 1991; Zirger & Maidique, 1990) have confirmed that innovation is successful when it is closely linked with the firm's competencies. The reason is that existing competencies could be used as leverage points to contribute new competencies, which is to reduce risk and make use of slack resource (Özbağ & O., 2015). Consequently, Gary and Prahalad (1994) argued that to leverage core competencies, managers need to avoid a product-centric view of their firm and examine the capabilities on which their main products are established on See (Table 1).

Proposition 4: *Any innovation process that is detached from the firm's core competencies is likely to fail. Until the firm's existing core competencies are relied upon to provide the required leverage to reduce risk, innovation process cannot be successful let alone, providing competitive advantage*

5. Proposed conceptual model

A conceptual framework has been given different definitions by researchers and scholars in different context at different times. For example, conceptual framework is the document that "explains, either graphically or in narrative form, the main things to be studied and the key factors, concepts, or variables; and the presumed relationships among them" (Miles and Huberman, 1994, p. 18). It is a system of concepts, assumptions, expectations, beliefs, and theories that supports and informs your research (Maxwell, 1996, 2005, p. 39). Reichel and Ramey (1987) described conceptual framework as a set of broad ideas and principles taken from relevant fields of enquiry and used to structure a subsequent presentation. When undoubtedly expressed, a conceptual framework has likely versatility as a tool to scaffold research, and therefore to assist a researcher to make meaning of subsequent findings (Smyth, 2014).

In literature, different authors use different narration for innovation process phases, an absence of common narration therefore emerges. That notwithstanding, a critical look at the various process models (one example included) into core innovation process factors consist of inputs and outputs (Du Chatenier, 2009), featuring mostly of initiation and implementation phases (Beausoleil, 2018). However, no model has integrated innovation cost, benefits, and competencies necessary for successful innovation and mapped unto the various phases or stages identified. Consequently, after a thorough review of literature on innovation process model, innovation cost, benefits, and the competencies required to support innovation, this paper has categorized innovation cost into six under the three-stage process adapted from Thompson (1965) with three main benefits and different competencies and mapped unto an integrated framework.

Thus, making the proposed model so critical for successful innovation process. The proposed model looks at every stage in the light of the cost that will incurred at that stage, the benefits that will be accrued for meeting that cost, and the competencies required to execute the essential activities. This will make it possible for firms to assess the costs and benefits to ensure value for money innovation. Additionally, the resources and competencies possess by the firm will also be examined to determine whether the firm will be able to accomplish whatever is started. This is one unique benefit of the proposed model that cannot be found from the other models. This is so because whatever is started will not be abandoned midway for lack of resources and competencies (see Figures 1, 2, and 3).

Figure 2. Example of innovation process model from Bunduchi and Smart (2010).

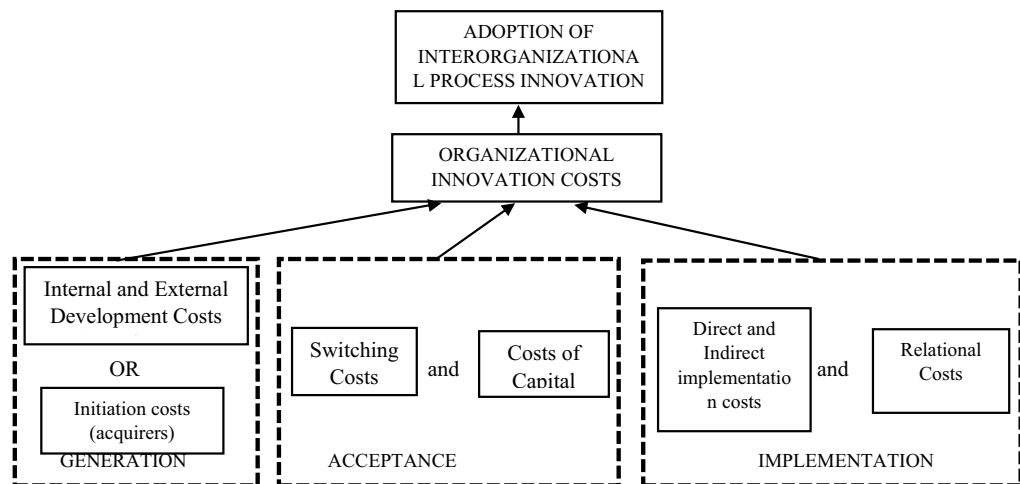
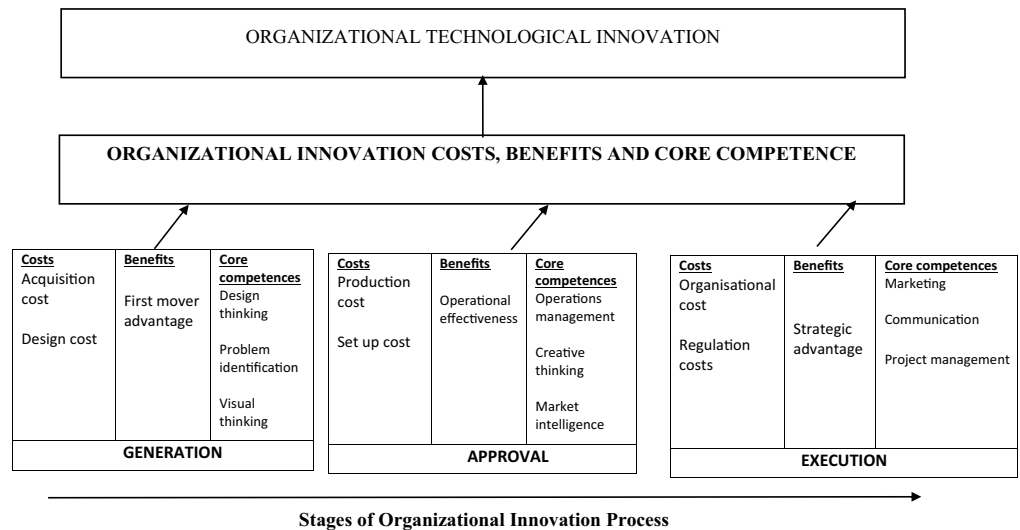


Figure 3. The proposed framework of innovation costs, benefits and core competences on innovation stages.



6. Conclusion and implications for research and practice

To date, researchers and practitioners have not been able to agree on the actual components of innovation costs and benefits in technological innovation. The few attempts that have been made in literature to identify the different components of innovation costs and benefits do so in isolation. Till date, no study has looked at innovation costs, benefits and competencies needed for innovation integratively although, firms' competencies enhance their ability to innovate, and no firm innovates successfully without linking innovation with its core competence. This study has developed a single, coherent framework that integrates the costs organizations incur during the various stages of the organizational innovation process, the benefits associated with the stages and the competencies needed at the various stages of technological innovation. The framework offers a unified perspective of different costs and benefits associated with organizational innovation. Thus, providing a platform for further research into not only the role of costs and benefits of innovation, but how the competencies possess by firm also shape technological innovations. The framework also offers policymakers with a mechanism to identify the type of costs, benefits and competencies that go with the various stages of the innovation process. With this insight, policymakers will be able to formulate appropriate policies and legislation to support innovative organization. For example, being aware of the costs associated with the stages, the benefits that accrue and the competencies and skills required, policy makers will be able to decide whether innovation will be carried out internally alone or in collaboration with other organizations or even to acquire an externally developed innovation. This will enable the government (policymakers) to determine the kind of resources: equipment/tools, incentives and consultancy service offered to innovative firms.

Managerially or in practice, the proposed framework presents managers with an efficient system and technique to identify the probable costs, benefits and competences required for innovation. Ideally, the availability of this vital knowledge will support managers to put up a solid argument for investment. Available evidence indicates that an awareness of the various costs associated with information technology usage is vital to back a vigorous appraisal by business units of the value added by information technology services (Ross et al., 1999). Despite the essence of this vital knowledge and understanding for business performance, usually, this understanding is absent in businesses, leading to abysmal performance. Therefore, the integrated framework in this study will empower managers to consider all the costs, benefits and competence required for innovation instead of considering only one of these critical variables of innovation and suffer the consequences thereof. Additionally, depending on the financial resources and competencies available, the model will afford managers the opportunity to shape their recruitment process and other human resource practices such as training and development to offer.

Theoretically, this paper has extended our knowledge in innovation process model: by introducing an integrated model of costs, benefits and competencies required for innovation at the various stages. The paper has also shown that different stages of innovation demand different costs, offer different benefits and require different competencies. It has also heightened the fact that firms can be successful in their innovation only when proper mechanisms are put in place to ensure that the firm's specific context and the suitability of the innovation type are well-connected, costs and benefits identified and appropriated, and the relevant stages involved in the process together with the competencies required are mapped onto appropriate framework.

This paper not only throws light on the questions which costs need to be considered in innovation? under which process model should innovation be considered? It also problematizes the questions what competences are required to reap the benefits of innovation? and how innovation might be economically organized in the organization making use of the available skills set of staff? The analysis of these questions suggests that transaction costs, incentives, and agency problems (Mahnke, 1998) are integral part of any innovation process. Ignoring these variables may cause innovation initiatives to fail even if potential benefits are in principle available.

Furthermore, the argument put forward in this paper suggests that organizational technological innovation without mechanisms to identify costs, benefits and competences required and to prevent the risk of imitation or leakage is unlikely to generate rents. Since innovation usually comes with high up-front expenditures (e.g., infrastructure-investments, production costs, design cost, organizational cost), any innovation initiatives that do not identify potential benefits and costs ex-ante, clearly encounter the risk of eroding rather than enhancing competitive advantage. Therefore, costs, benefits and competence set for innovation together with the risk of imitation require close managerial attention.

7. Limitations and suggestion for future research

Even though document analysis is widely utilized as a qualitative research method, like any other concept in management, it has limitations. Admittedly, the literature reviewed in this paper offer background and context, it is restricted to a selection of associated theoretical and empirical studies (Beausoleil, 2018). For this paper, the analysis was restricted in scope and tendentious in selectivity and judgment. The literature reviewed presented a wider scope, over a long stretch of time, across industries and disciplines, with no specific industry or discipline concentrated. Thus, implying that innovation process model works the same across industries and disciplines. There is also the issue of tendentious astuteness (Yin, 1994), depicting a deficient selection of articles published by low-ranked journals and less cited authors (Beausoleil, 2018). Additionally, the paper is also biased toward literature on innovation benefits, cost, competencies, and stages to produce the conceptual framework thereby, making the framework appear as an “excellent model” Consequently, further research is required to verify the validity of the proposed framework.

This paper has advanced potential areas of future research that will help in understanding fully the role of costs, benefits, and competence in shaping organizational innovation. In addition to basic research to enhancing understand in the innovation processes in specific context, several critical issues need clarification, including how technological innovation can be organized economically in specific context, what is the impact of organizing innovation with more of the skills set from outside the organization on the design and agency-costs of innovation? Which kind of skills should be utilized in specific context to ensure innovation is economically organized to ensure value for money?

Again, different categories of costs associated with organizational innovation have been identified together with the essential competences and skills for different stages. Research is now required to quantify the weight of these costs and the competences and skills set required for specific technological innovations, such as using Microsoft Teams or Zoom in delivering academic programme. Future studies could examine the costs incurred by both developer and acquiring organizations within a particular industry. Future research is highly encouraged to empirically test the proposed framework in the study to confirm its potency. The paper has identified the competences and skills needed for innovation at the various stages. It is also known that certain human resource management practices such as recruitment and training and development affect skills acquisition. Again, attracting and highly retaining skills staff call for high remuneration which either add to design cost or organizational cost. Now future research could investigate how recruitment and retention of highly skilled staff affect innovation process in terms of cost and benefits analysis.

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