# HUMAN CAPITAL IN SERVICE INNOVATION STRATEGY

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**ABSTRACT**

*The purpose of this research is to examine a driving force behind innovation - human capital – which we contend is useful in identifying and exploiting opportunities in both goods and services contexts. Traditional predictors of innovation, such as research and development and marketing expenditures, are based largely on physical goods literature and are not necessarily appropriate given the unique challenges inherent in services. Drawing on the literature related to human capital theory, this research proposes that investment in employees is an innovation predictor that embraces the nuances of both goods and services firms. Our results suggest that human capital investment is a stronger predictor of innovation than traditional physical goods based predictors across both goods and services contexts. For managers, the findings suggest that greater long-term investments in human capital lend themselves to greater innovation.*

**JEL**: M31, J24

**KEYWORD**: Innovation, Human Capital, Resource Investments, Knowledge

## INTRODUCTION

Change is ubiquitous. Those who remain inflexible and unchanging are eventually relegated to obscurity. In order to avoid this, individuals, companies, and countries alike compete to achieve first-mover advantage (i.e., the spoils awarded those who provide desired goods and services before others). This advantage may allow first entrants enhanced earnings potential and/or to gain control over resources others may not be able to match (Grant 2003, and Lieberman and Montgomery 1988).

In order to achieve first-mover advantage, entrants must innovate. In short, they must create new solutions that meet new requirements, inarticulate needs, or existing market needs. This is accomplished through creating more effective products, processes, services, technologies, or ideas (Frankelius, 2009). Indeed, companies in Booz and Company's Global Innovation 1000 (its list of the top 1000 firms in terms of investment in research and development) collectively spent over $600 billion on innovation in 2011, a 9% increase over 2010 and part of a 6% average annual increase in innovation spending between 2001 and 2011 (Jaruzelski, Loehr and Holman 2012). Those investment totals are compelling given that the total value of global trade according to the World Trade Organization (WTO) in 2011 was about $15.2 trillion USD (wto.org 2011). Put simply, these data indicated that the largest 1000 research and development (R&D) firms spent funds amounting to about 2.5% of the total value of all goods and services traded worldwide in that year on innovation.

Concomitantly, innovation is often regarded as a key component of sustainable competitive advantage (Baden-Fuller and Stopford 1994). Accordingly, organizations that successfully innovate typically experience larger profits and have more loyal customers than their less innovative counterparts (Storey and Easingwood 1999). As a result, many companies emphasize innovation in their competitive strategies. Such weight on innovation is evident in the mission statements and business values of many leading companies such as "…our No. 1 goal - helping our clients innovate…" (accenture.com 2008) and "Our goal is to carry on his legacy of innovative thinking…" (nikebiz.com 2008).

As competition in many markets intensifies and world economies continue to falter, firms are becoming more reliant on innovation efforts for basic survival (BusinessWeek 2008). Specifically, profit margins are shrinking, resource investments are under increasing scrutiny, and organizational executives are being held responsible for sound decision-making (Fairfax 2002). As a result, there is a growing need for firms to innovate in order to generate sales, while simultaneously using fewer resources. Firms have limited capital to invest in innovation and need to decide which investments yield the most sustainable results. Proper allocation of resources for innovation is, thus, a critical factor in determining a firm's longevity. Firms that ineffectively allocate and manage resources risk extinction.

Based on preliminary data, this research investigates the possibility that, despite their expense (Lemke and Lins 2012), employee retirement programs actually promote innovation. In contrast to prior research which focuses on marketing and R&D expenditures as proxies for innovation (e.g., Mairesse and Mohnen 2002, and Song and Thieme 2006, and Nijssen, Hillebrand, Vermeulen and Kemp 2006) we contend that increases in retirement spending are indicative of a good-faith, long-term, investment in employee human capital accumulation and, ultimately, innovation.

This article is organized as follows: first, we present a review of current literature in order to develop a conceptual framework wherein innovation is cast as the outcome of various strategic investments. Next, we discuss the limitations of traditional predictors, such as R&D and marketing expenditures in the context of contemporary theoretical conceptualizations. We then introduce human capital theory (Becker 1964) as a potentially valuable predictor of innovation. Next, we describe the data sources and the results of the analysis are detailed. The article concludes with a discussion of managerial and theoretical implications along with potential limitations and directions for future research.

## LITERATURE REVIEW

Management of innovation becomes more critical by accelerating technological advances and changing consumer preferences (Aragón-Correa, Garcia-Morales and Cordón-Pozo 2007). For example, the environmental focus evident in directives such as "going green" and "sustainability" are becoming important innovation issues (e.g., Gunther 2008, and Mitchell 2003). As a result of changing conditions, organizations are forced to continually reinvent their offerings to remain competitive (Menor, Tatikonda and Sampson 2002). To maintain or grow profits, organizations need to continually develop and manage resources for innovation in order to appeal to existing and new customers. Specifically, such processes require attention to, integration of, and institutionalization of, new ideas and resources (Sorescu and Spanjol 2008, and van de Ven 1986).

Specifically, there is a transformation of work systems underway that compels a change from industrial to knowledge-based work systems (Kochan, Orlikowsk and Crutcher-Gershenfeld 2003). These authors note that in a knowledge-based economy, high levels of performance can only be achieved by organizing work in such a way that employees both use and deepen their skills (i.e., enhance their human capital), while simultaneously collaborating with others on multiple (often temporary) projects. Similarly, there is an increasing emphasis on diversity, and the use of cross-functional teams and task forces (Kochan et al. 2003). Ultimately, the thrust behind organizations moving toward knowledge-based systems is increased organizational flexibility and the enhanced potential for innovation (Kochan et al. 2003).

Prior research identifies research and development (R&D) and marketing as key innovation resources (e.g., Mairesse and Mohnen 2002, Song and Thieme 2006). Research and development is, thus, identified based on its support of new product development (e.g., new technologies, materials, and machinery) (Sher and Yang 2005, and Veryzer 2005). Marketing, on the other hand, is credited for its part in communicating new product rollouts (Nijssen et al., 2006). However, substantial limitations exist related to how these investments encourage innovation (particularly service innovation) (c.f., Damanpour 1991).

For example, services rarely employ R&D departments or report R&D on financial statements due to issues of intangibility (Nijssen et al. 2006). In addition, research and development and marketing are shown to be weak predictors of innovation even in physical goods industries (Evangelista, Sandven, Sirilli and Smith 1998).

Another potential driver of innovation noted in the management and economics literatures is human capital (Hitt, Bierman, Shimizu and Kochhar, 2001, and Jones and Schneider 2006, Lepak and Snell 1999, and Snow and Warren 1990). Building from prior conceptualizations of human capital (e.g., Baruch 2004), we define it as an individual's accumulation of education and new skills. Human capital is described as the cornerstone of creative thinking, knowledge generation, and innovation management (Chen and Huang 2009, and Hitt et al. 2001, and Im and Workman 2004). Accordingly, we posit that investment in human capital is a significant piece of the innovation puzzle and a quintessential component of innovation strategy.

Unfortunately, prior studies of human capital tend to limit their foci to either macro-economic issues such as the average skill base of entire nations (e.g., Jones and Schneider 2006, and Snow and Warren 1990) or micro issues such as human resource development strategies (e.g., Chen and Huang 2009; Hitt et al. 2001, and Lepak and Snell, 1999). Although such research is noteworthy, these approaches do not specifically address the role of investments in human capital at the firm level, or their potential impact on innovation. Our research attempts to fill this gap by empirically investigating the relationship between human capital investments and innovation outcomes using firm-level data. Specifically, we make preliminary assessments of the potential impacts of different resource investments on innovation. In addition, we compare the ability of human capital investments to explain innovation in service and goods firms vis-à-vis R&D and marketing investments.

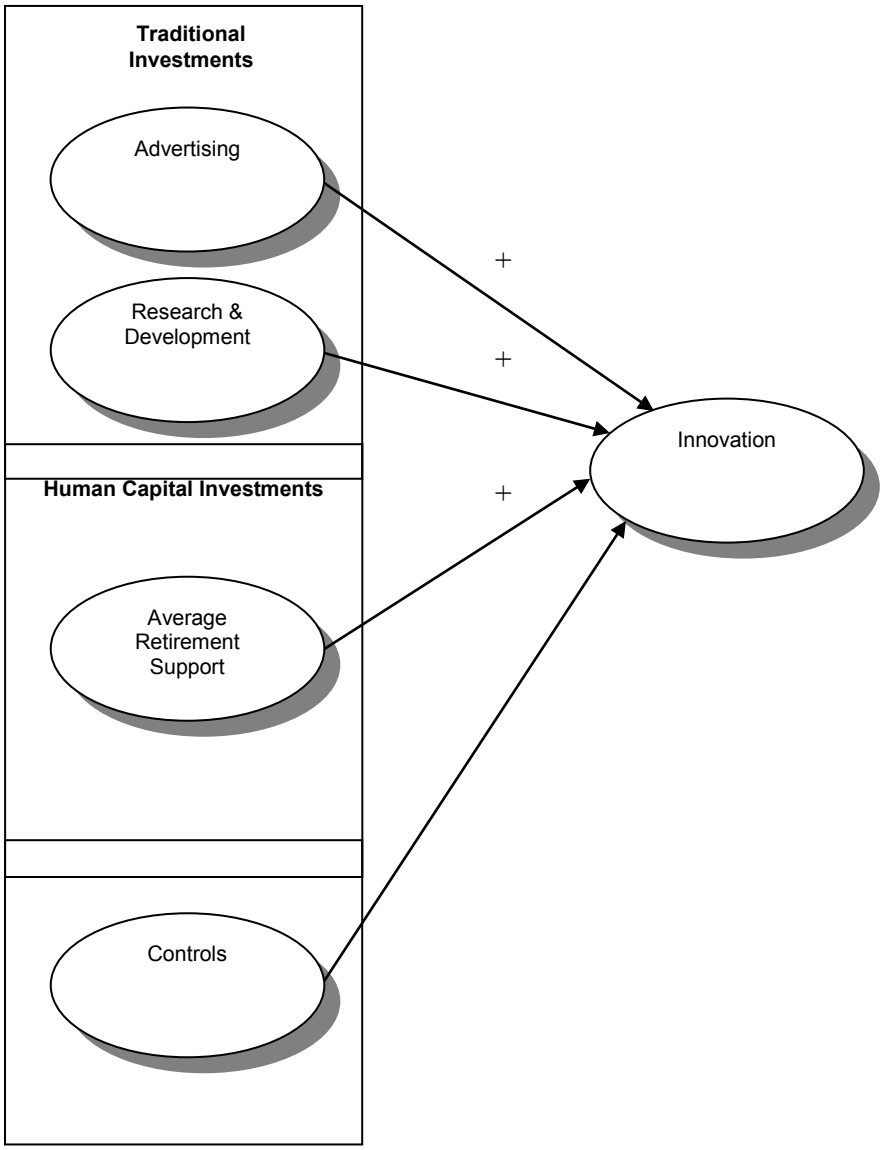
Conceptual Framework

This section describes our hypothesized relationships. The conceptual model that defines these relationships is identified in Figure 1. The innovation predictors identified on the left side of the figure lead to innovation on the right side of the figure. The first investments identified are the traditional predictors of innovation (R&D and marketing expenditures). Human capital is placed in the middle of the figure as a potentially more universal predictor of innovation. We also note control variables that may impact innovation at the bottom part of the figure.

The benefits of innovation. Innovation is an established catalyst for firm performance and competitive advantage (Madhavan and Grover 1998, and Sher and Yang 2005, and Storey and Easingwood 1999). Specifically, firms' efforts to innovate positively affect existing products, customer choice, and preferences for new products, and competitive market dynamics (King and Tucci 2002). Thus, we expect innovation to bolster long-term performance by increasing profit margins, generating customer loyalty, and limiting competitive entry into markets (Ferguson and Hlavinka 2007).

Existing products primarily benefit from innovation in complementary product categories that create resurgent demand for established products. For example, advances in computer memory, processor speed, and software cause computers to obsolesce at rapid rates, creating a constantly renewing cycle of demand for new computers (Whelan 2002). Further, innovation aids existing products through updates that prolong product lifecycles and stave off product declines (Berenson and Mohr-Jackson 1994). For instance, beer producers continue to update packaging (e.g., aluminum bottles, temperature indicating labels, and carbon dioxide distribution systems) despite the product's existence for thousands of years. Such innovations can sustain or even rejuvenate brand image, motivate current customers to increase consumption patterns, or increase positive word-of-mouth (King and Tucci, 2002).

Figure 1: Conceptual Model of Human Capital versus Traditional Investments




*This is a model of the relationships among human capital support and traditional innovation predictors such as advertising and R&D. The proposed model contends that there is a direct positive relationship between the predictors and innovation.*

In addition to existing customers, innovation draws new customers to firms and simultaneously could diminish the customer bases of competitors (Storey and Easingwood 1999). New customers increase market share and aid in generating economies of scale, as relative costs often decrease substantially as a function of the number of product adopters (Jovanovic and MacDonald 1994). Further, such actions also pave the way for future products by reducing the effort required to position a product and induce trial (Jovanovic and MacDonald 1994).

In summary, innovation translates into substantial advantages in the marketplace. Specifically, innovation creates new markets, reenergizes existing markets, and provides competitive differentiation in both goods and services. These advantages justify such strategies as price skimming and image pricing, which generate increased profits (Garrido-Rubio and Polo-Redondo 2005). To achieve these advantages,

managers need to understand what resource investments to make in order to optimize innovation efforts. In line with our research objectives, the next two sections discuss resource investments for innovation.

Traditional resource investments. Marketing and R&D expenditures are identified (see Figure 2.1) as traditional resource investments that lead to innovation (Bruce and Cooper 1997, p. 20, and Sher and Yang 2005, and Veryzer 2005). Definitions of innovation vary. For example, Lumpkin and Dess (1996, p. 142) call it "…a firm's tendency to engage in and support new ideas, experimentation, and creativity for the development of new processes." Others emphasize the importance of organizational support for innovation vis-à-vis investments in such resources. As a result, the physical goods literature suggests that R&D and marketing expenditures positively relate to innovation (e.g., Veryzer 2005).

Unsurprisingly, innovative firms typically invest more in R&D than do their less innovative peers (Sher and Yang 2005, and Veryzer 2005). Concomitantly, such investments often increase due to the need to procure new materials and equipment for product development (Wouters, Anderson, Narus, and Wynstra 2009). New items frequently incur greater costs as component procurement and production initially lack economies of scale (Wouters et al. 2009). Innovative firms also invest a great deal in prototyping, which generates large amounts of waste until production processes are honed for the final product (Wheelwright and Clark 1992).

The impacts of innovation continue to be extolled in trade publications such as BusinessWeek (e.g., BusinessWeek, April 28, 2008). For example, Google's CEO suggests that innovative firms invest heavily in R&D spending even during recessions (BusinessWeek, April 28, 2008). This statement is validated by a 72 percent increase in R&D spending at Google in 2007 despite a declining economy (BusinessWeek, April 28, 2008). Such statements and actions are typical of firms that stress innovation as a key competitive activity.

In addition to R&D, marketing expenditures are typically higher for innovative firms, as new products require more intense marketing efforts to support initial rollouts (Bruce and Cooper 1997, p. 20). Specifically, marketing expenses tend to rise as the number of new products increases. This is a result of continual efforts to build customer awareness and knowledge about new products. The costs of such efforts can be substantial for innovations due to customers' lack of familiarity with new product features, advantages, and uses (Karniouchina, Victorino, and Verma 2006). In other words, marketing communications intensify as firms position new products and try to persuade new customers to recurrently buy these items. These efforts reduce the benefits that normally accrue from economies of scale as firms update their messages to stay consistent with new competitive offerings (Nijssen et al. 2006).

Despite the noted advantages of R&D and marketing expense as innovation predictors, each has several disadvantages. First, most of the literature regarding R&D and marketing effects is based on physical goods innovation (Lilien, Kotler and Moorthy 1992). As academics and practitioners begin to focus more heavily on services, the impact of service idiosyncrasies such as heterogeneity, intangibility, perishability, and simultaneity calls into question the transferability of knowledge related to physical goods innovation to services (Nijssen et al. 2006). Second, R&D and marketing often are identified in the literature as weak predictors of innovation because such investments do not always lead to desired outcomes (Damanpour 1991, and Evangelista et al. 1998, and Nijssen et al. 2006).

This is particularly true in services where R&D investments rarely are reported on financial statements and marketing success may be more a result of word-of-mouth than of formal marketing efforts (Nijssen et al. 2006). Third, both goods and services firms rely on human capital to transform investments into innovative outcomes. Such reliance on human capital suggests that investments in employees are perhaps better predictors of innovation than R&D and marketing expenditures. To expand the field's

understanding beyond existing innovation predictors, our research suggests that human capital investments represent a potentially powerful predictor of innovation.

The role of human capital in innovation**.** According to Becker's (1962, 1964) human capital theory, those having more job specific resources (e.g., training and education) should receive more organizational rewards (e.g., promotions and higher pay). Additionally, investment in human capital, both by individuals and organizations, is undertaken primarily to enhance performance (Becker 1962). Employees are seen as a firm resource, much like financial capital, that can be strategically deployed to achieve objectives (Barney 1991, and Hitt et al. 2001). As with financial capital, greater human capital is thought to be beneficial to firms (Lepak and Snell 1999). Unlike financial capital, however, human capital is an abstract concept referring primarily to intangible skills and knowledge (Jones and Schneider 2006). The value of employees in innovation efforts is reflected in the returns firms earn on innovation as a result of investments in human capital (Shrader and Siegel 2007). That is, employees with better skills and knowledge are more likely to effectively develop and implement innovations (e.g., Siegel, Waldman and Youngdahl 1997). Further, human capital theory (Becker 1962, 1964) states that firms compensate employees for the value their skills return to the firm (Lepak and Snell 1999).

Human capital research focuses on identifying and assessing skills that benefit firms (e.g., Jones and Schneider 2006, and Kessler and Lülfesmann 2006). Specifically, unique and valuable skills are suggested to foster performance and competitive advantage (Kessler and Lülfesmann 2006, and Lepak and Snell 1999). Skills such as opportunity recognition, creative idea generation, problem solving, and risk coping are identified as the lifeblood of innovation (Chen and Huang 2009, and Madsen and Ulhøi 2005). These skills allow employees to contend with the relatively high levels of uncertainty inherent in innovation processes (Nijssenet al. 2006). Further, lack of skill and experience is designated as a key barrier to product development and financial success (Drew 1995). Such findings are identified from entry-level employees to top executives (Buchholtz, Ribbens and Houle 2003) and highlight the potential value of human capital to innovation.

In addition to skills, employee knowledge drives innovation (Becker 1964, and Lepak and Snell 1999). According to the knowledge-based view of the firm, knowledge is a renewable resource that employees acquire through formal education and "on-the-job" socialization and training (Grant 2003, and Hitt et al. 2001). Employees combine these forms of knowledge and adapt them in order to respond to ever-changing business problems (Leonard and Sensiper 1998).

Knowledge, like skill, is shown to benefit innovation by increasing opportunity recognition and problem solving, while limiting the ability of competitors to duplicate it (Becker 1964, and Chen and Huang 2009, and Hansen 1999, and Hitt et al. 2001, and Leonard and Sensiper 1998). Such capabilities lead to lower costs, enhanced product offerings, and competitive differentiation (Carmona-Lavado, Cuevas-Rodriquez and Cabello-Medina 2010). Further, knowledge often lends itself to innovation by being firm specific and socially complex, thus reducing its potential for mobility to other firms (Chen and Huang 2009).

Benefits derived from human capital, whether in services or physical goods markets, typically are not without costs. That is, they are exchanged for other resources (Becker 1962). For example, firms exchange financial resources (e.g., employee compensation and training opportunities) for the knowledge created and acquired by its employees (Becker 1962, 1964). If either party fails to uphold its obligation in the exchange, the quality of the relationship suffers or ceases entirely. Employees typically refuse to work for less compensation than their perceived relative worth (Lepak and Snell 1999, and Ployhart, Weekley and Baughman 2006). Additionally, firms do not usually provide superior compensation in exchange for substandard performance (Becker 1962, and Ployhart et al. 2006). Exceptions to this rule undoubtedly exist, but both firms and employees generally seek equity in their exchanges (Adams 1965).

Equity theory (Adams 1965) assumes employees are motivated to balance their perceived organizational inputs (e.g., work effort) versus outcomes (e.g., pay). According to this theory, employees refer to others in their organizations to determine if they are being treated fairly and paid based on what they see others receiving. If employees believe that they work too hard to be making what they do, they feel negative inequity (Adams 1965). These employees are, thus, motivated to eliminate this unpleasant feeling and restore balance. The behaviors that they may subsequently engage in have implications for innovation. For example, they may reduce the level and persistence in their tasks, they may seek other employment, and they might engage in counterproductive work behaviors (e.g., employee theft) (Adams 1965). Such reactions are feckless and inhibit organizational innovation.

According to human capital theory, it is imperative to properly compensate individuals for skills and knowledge that contribute to innovation (Becker 1962). For firms seeking innovation, compensation should be designed specifically to engender creativity, problem solving, and risk taking (Chen and Huang, 2009, and Delery and Doty 1996). A large amount of research suggests that retirement plans (e.g., 401(k), Roth 401(k), and pensions) are among the most important forms of compensation for recruiting, retaining, and motivating quality employees (e.g., Coronado, Mitchell, Sharpe and Nesbitt 2008, and Gough and Hick 2009, and Loretto, White and Duncan 2000). Such retirement plans represent compensation above-and-beyond basic wages and typically receive some subsidy from firms rather than by employees alone (Loretto et al. 2000). As a result, companies offering these plans are seen as caring and as fulfilling their psychological contracts – unspoken promises not articulated in the fine print of an employment contract which relate to expectations about what employees are expected to give and what they get in return (Baruch 2004) – with their employees.

Companies seek to link the managed risk taking necessary to innovate with pay structures, bonuses, recognition and career progression (Anthony, Johnson, Sinfield and Altman 2008). Managers should also create developmental paths with high potential for employees to spend time on promising innovative opportunities (Anthony et al., 2008 and Cascio, Mariadoss and Mouri 2010). These actions deepen the psychological contracts related to compensation and continuity. If firms do not attend to such contracts, firm performance declines. Organizations that fail to address these unwritten expectations would expect lower employee involvement and commitment, higher turnover – both voluntary and involuntary, higher HR costs, and, ultimately, impaired innovative capabilities (Baruch 1998). Employee retirement plans help reduce the risk of this happening because they both specify what employees will receive for their contributions to the firm and connote tenure and job security.

Unfortunately, given the dire consequences associated with shrinking resource availability, many firms are emphasizing cost-cutting strategies instead of growth strategies, whereby resource investments are reduced (BusinessWeek, 2008). A key area in which firms are seeking to trim excess cost is in human capital investments. Specifically, employee retirement plans are being cut out of compensation packages in order to reduce financial burdens (Golding 2008).

Cutting such plans reduces employee motivation and loyalty and increases turnover (Golding, 2008). For example, some of the most under-funded plans belong to airlines, while better-funded plans exist in the financial services and public sectors (Lachance, Mitchell and Smetters 2003). The discrepancy in employee retirement plans is coupled with noted praise in the marketplace for financial service innovations (Gentle 2007) and rebuke for a lack of innovation in airlines (Kochan, von Nordenflyht, McKersie and Gittell 2005). Emphasizing cost cutting over growth often leads to efficiency, but not necessarily to effectiveness (Byrne, Lubowe and Blitz 2007). Short-term benefits associated with cutting human capital costs, therefore, may reduce a firm's ability to innovate and cause it to mortgage its long-term survivability in favor of meeting immediate performance demands.

Unfortunately, employee retirement plans are not as common as they used to be given the burden placed on employers to provide the annuity stream due employees or to absorb additional short-term costs. However, there is evidence that even in highly competitive and cost-conscious economic environments, such plans are still a desirable attribute for companies wishing to attract and retain high quality employees. For example, Ippolito (1991) notes that evidence supports assertions that employee retirement plans such as pensions do not promote wage-tilt (being paid less early in employment and more towards the end of a career with a firm irrespective of achievement and tenure). This, of course, makes hiring and retaining newer employees simpler and more attractive to them as well as reducing aggregate levels of dissatisfaction (Ippolito 1991).

Similarly, some organizations that moved from a defined benefit program (e.g., pension) to a defined contribution (e.g., 401(k)) have found employees prefer the pension and are willing to buy it back. By paying an upfront fee and commuting the 401(k) back to a pension, employees believe (rightfully) that if the buy-back price falls below the benefit level at the time of exercise that they may, in fact, enjoy a financial windfall. In addition, this benefit comes to them without the amount of market volatility that accompanies savings invested in defined contribution plans (Lachance et al. 2003).

Advantages of human capital over traditional predictors. Investments in human capital have several advantages over traditional innovation drivers such as those in R&D and marketing. First, people are critical, yet often overlooked, drivers of innovation in both goods and services (Lepak and Snell 1999). All organizations rely on some amount of human activity in order to deliver services and produce physical goods, thereby placing a substantial burden for success in the hands of employees (van de Ven 1986). This suggests a labor-intensive view of innovation and indicates that firms should account for organizational factors such as employee compensation when seeking innovation (Srinivasan, Lilien and Rangaswamy 2002). Indeed, internalization theory (Graham 1978) suggests that firms innovate by investing in their own knowledge and technologies (i.e., those known and managed by employees). It further contends that superior returns on investments made in employees may occur if such innovation and investment is not licensed across firms or borders, but instead is used as the basis for acquiring subsidiaries.

Human capital is a primary means through which firms achieve goals (Chen and Huang 2009). More specifically, innovation depends on the knowledge and expertise of employees to translate investments into outcomes (Cho and Chang 2008). Capabilities that bolster innovation are necessarily complex and result from deliberate actions by educated and experienced workers with a desire to perform innovative actions (Becker 1964, and Chen and Huang 2009).

Second, human capital investments are potentially more universally applicable than other investments. Specifically, innovation drivers (resource investments) have not been updated adequately to account for the aforementioned service idiosyncrasies that may render established predictors ineffective. Further, R&D and marketing investments are much less pronounced and much less stable predictors of innovation, particularly in services (Damanpour 1991, and Evangelista et al. 1998, and Nijssen et al. 2006). However, capable personnel are universally identified as key ingredients in innovation irrespective of industry (Hitt et al. 2001, and Jones and Schneider 2006, and Lepak and Snell 1999, and Snow and Warren 1990).

## DATA AND METHODOLOGY

### Data Sources and Sample

The data set is constructed from two sources (COMPUSTAT and *Fortune's* Most Admired Companies) for the years 2005-2008. COMPUSTAT is a Standard & Poor's database containing financial data for

over 45 years and more than 28,000 companies. The *Fortune* rankings are generated each year by the Hay Group and are part of *Fortune's* Most Admired Companies list. To arrive at the list, the Hay Group surveys over 16,000 executives, directors, and financial analysts in over 65 industries about Fortune 1,000 companies. The final sample includes 251 goods firms (e.g., Nike, General Mills, Texas Instruments, and Mattel) and 367 service firms (e.g., Marriott, Google, Accenture, and eBay) representing over 50 industries that could be matched between the databases in the available years. Companies ranged in number of employees from approximately 1,000 to 200,000 with a median value of 6,000. In addition, retirement support ranged from -$867 million (in which case the company not only eliminated, but absorbed the existing retirement support) to $7.9 billion with a median value of just under $1 million. The advantage of a wide range of organizations and industries is in the ability to generalize the findings.

Secondary data sources are utilized here for an important reason. Specifically, secondary data sources provide access to a wide array of information, which promotes generalizability. Further, *Fortune* rankings and COMPUSTAT data are utilized in a variety of prior finance, management, and marketing research and are suggested to be valid measures of firm characteristics (e.g., Brammer, Brooks and Pavelin 2006, and Wiles 2007). For example, Brammer and colleagues (2006) assess the link between social responsibility via *Fortune* rankings and stock returns. Their findings indicate that social responsibility and financial performance are negatively related. In addition, Wiles (2007) utilizes *Fortune's* Most Admired Companies data and COMPUSTAT data to examine the relationship between customer service and retail shareholder wealth. His findings suggest that firms benefit from customer service initiatives.

In this study, data on human capital, R&D, and marketing expenditures are regressed upon innovation rankings, while controlling for firm size, prior performance, and goods versus services industry. Each component of the regression is discussed in greater detail below. The variables, their operationalizations, and data sources are summarized in Table 1.

Table 1: Variables and Data Sources

| Conceptual Variable | Measured Variable | Data Source |
|---|---|---|
| **Dependent Variable** | | |
| Innovation | Average industry ranking from industry experts | *Fortune's* M.A.C. |
| **Human Capital Variable** | | |
| Employee Retirement Plan Support | Average retirement support standardized by industry | COMPUSTAT |
| **Other Predictor Variables** | | |
| R&D | Research and development expenditures standardized by industry | COMPUSTAT |
| Advertising | Advertising expenditures standardized by industry | COMPUSTAT |
| **Control Variables** | | |
| Firm Size | Natural Logarithm of total assets | COMPUSTAT |
| Performance | Natural Logarithm of Tobin's Q | COMPUSTAT |
| Goods or Services Industry | Goods = 0; Service = 1 | *Fortune's* M.A.C. |

*M.A.C. = Most Admired Companies. The panels of this table show the sources and forms of the data used in the regression analysis.*

Operationalization of Variables

Variable transformations. Operational variables often exhibit heavy skewness (violating the assumption of normality) and therefore need to be normalized (Gruca and Rego 2005). For example, the number of small firms is typically much greater than the number of large firms, causing the statistical distribution to be skewed toward low values for size. Normalizing the variables reduces the extent to which outliers with high values impact the results. The total assets, employee retirement expenditures, R&D expenditures, marketing expenditures, and Tobin's Q data for this study are no different. Thus, each is transformed via natural log function (e.g., Luo and Bhattacharya 2006). Further, as innovation is scored from 1 to 11 (highest to lowest), the scores of the predictor and control variables are reversed (i.e., multiplied by –1) so that higher scores have lower values (numbers).

In addition, innovation efforts themselves may differ by industry. For example, semiconductors are likely considered to be more innovative than job placement services. Therefore, it is also useful to account for potential industry differences (Zenkin and Dolya 2007). The *Fortune* data, however, do not account for these relative differences. Predictor and control variables are therefore standardized within each industry. Specifically, the industry mean for the variable is subtracted from each observed value in the industry and is then divided by the standard error for the variable in each industry. This transformation makes each firm's values relative to others in its industry, which is similar to the measure of innovation. In other words, industry standardization allows industries with very different market dynamics to be directly compared.

*Innovation.* Consistent with prior research (e.g., Luo and Bhattacharya 2006), industry rankings from *Fortune* are used to operationalize innovation. The database provides rankings from 1 to 11 (highest to lowest) for firms within each industry based on survey results provided by industry experts. Innovation therefore begins as a latent construct created from expert opinions and is transformed into industry rankings.

*R&D investments.* In this research, firms' R&D investments are operationalized through R&D expenditures (e.g., Gruca and Rego 2005, and Luo and Bhattacharya 2006). Such expenditures serve as proxies of firms' commitments to research, and accordingly, to innovation. Data on R&D expenditures are collected from COMPUSTAT.

*Marketing investments.* Firms' investments in marketing are operationalized via their advertising expenditures (e.g., Zenkin and Dolya 2007). Although marketing encompasses much more than advertising, advertising expenditure, as measured by COMPUSTAT, has advantages as a proxy measure for marketing investments. For example, COMPUSTAT data typically include marketing expenditures beyond what is specifically spent on advertising initiatives (Zenkin and Dolya 2007). In addition, promotional expenditures of any sort indicate a firm's level of commitment to marketing efforts (Luo and Bhattacharya 2006).

*Human capital investments.* Following suggestions from prior research (e.g., Chou 2007), relative annual employee retirement expense is used as the measure of human capital investments. Employee retirement expenses are selected for analysis over payroll expense for one key reason – they represent compensation above-and-beyond regular wages/salaries. Thus, these expenses are likely stronger indicators of firms' commitments to human capital accumulation and retention than simply noting levels of pay (Coronado et al. 2008, and Gough and Hick 2009, and Loretto, White and Duncan 2000).

Control variables. Control variables are included in the model to create better estimates of the research variables' contributions. Specifically, control variables remove explained variance in the research variables resulting from related factors. For example, larger firms are likely to have larger R&D budgets

than small firms. Thus, including firm size as a control removes any explanatory power from R&D that is truly the result of firm size rather than the R&D spending itself. Control variables, therefore, allow for a more pure assessment of the explanatory power of the research variables.

Consistent with prior strategic research, we control for firm size, performance, and industry (e.g., Luo and Bhattacharya 2006). Total assets are employed as a proxy for firm size, as they represent physical parts of firms that are not easily liquidated (Luo and Battacharya 2006). Firm size is controlled because larger firms are likely to have greater resources and therefore economies of scale when seeking innovation (Cohen and Klepper 1996, and Luo and Bhattacharya 2006). The total asset data are collected from COMPUSTAT. In addition to firm size, better performing firms are also expected to have more resources for innovation (Cohen and Klepper 1996). Prior performance vis-à-vis Tobin's Q is also controlled in the model. Finally, industries are categorized as either goods (0) or services (1) to highlight any potential industry differences in the data or other variables. A combination of *Fortune's* industry categories and Standard Industrial Classification codes from COMPUSTAT are used to classify firms as goods or services.

## RESULTS AND DISCUSSION

### Data Analysis

Descriptive statistics. The descriptive statistics for the dependent, independent, and control variables are provided in Table 2. Low median values for employee compensation ($Median_{2005}$ = \$41,400; $Median_{2006}$ = \$47,610) and negative minimums ($Min_{2005}$ = -\$973,000; $Min_{2006}$ = -\$714,000) support the notion that firms are reducing and eliminating employee retirement expenditures. Negative retirement minimums are indicative of reductions in support (e.g., firms removing money from pensions). Despite having a data set composed strictly of *Fortune* 1000 firms, there is still a wide range of firm sizes, R&D and marketing investments, and performance levels represented. Having a wide range of firms represented in the data enhances the generalizability of the results.

Table 2: Descriptive Statistics

| Variable | Mean | SD | Min | Median | Max | Skewness |
|---|---|---|---|---|---|---|
| **Dependent Variable** | | | | | | |
| Innovation 2006 | 5.09 | 2.77 | 1 | 5 | 10 | 0.173 |
| Innovation 2007 | 5.17 | 2.77 | 1 | 5 | 10 | 0.126 |
| **Tradition Investment Variables** | | | | | | |
| Advertising 2005[a] | 533.44 | 1,015.45 | 0.50 | 158.12 | 5,919.82 | 3.47 |
| Advertising 2006[a] | 549.79 | 1,052.28 | 0.70 | 156.46 | 6,866.40 | 3.77 |
| R&D 2005[a] | 676.96 | 1,527.79 | 0 | 103.00 | 9,094.00 | 3.23 |
| R&D 2006[a] | 732.64 | 1,459.37 | 0 | 112.99 | 8,258.00 | 2.98 |
| **Human Capital Variable** | | | | | | |
| Average Retirement Expense 2005[a] | 138.43 | 298.92 | -973.00 | 41.40 | 2,496.00 | 3.96 |
| Average Retirement Expense 2006[a] | 166.68 | 451.90 | -714.00 | 47.61 | 4,939.70 | 6.72 |
| **Control Variables** | | | | | | |
| Total Assets 2005[a] | 54,320 | 146,808 | 363 | 7,747 | 1,494,037 | 6.18 |
| Total Assets 2006[a] | 48,721 | 122,460 | 208 | 10,154 | 1,632,104 | 4.74 |
| Tobin's Q 2005 | 1.49 | 4.63 | 0.003 | 0.86 | 101.25 | 18.19 |
| Tobin's Q 2006 | 1.98 | 6.44 | 0.001 | 0.91 | 210.62 | 16.87 |

[a]*: thousands The panels of this table show the descriptive statistics for the data used in the regression analysis.*

Determinants of innovation. The results of the hierarchical regression are provided in Table 3. There is a lack of significance in the goods versus services control ($\beta$ = .01, $p$ > .46), which suggests a lack of

industry difference in the results. Research and development (β = .08, $p < .05$) and marketing (β = .11, $p < .01$) are significantly related to innovation when initially introduced into the model. These findings support prior research identifying the value of such metrics in predicting innovation. Despite each variable's significance, resulting gains in explanatory power beyond that of the control variables is relatively modest ($\Delta R^2_{step\ 2} = .006$, $p < .05$; $\Delta R^2_{step\ 2} = .011$, $p < .01$). Adding the human capital investments to the model nearly doubles the explanatory power ($\Delta R^2_{step\ 3} = .057$, $p < .001$). Further, human capital investments are shown to be positive predictors of innovation (β = .25, $p < .001$), which supports the notion that investing in employees is a valuable part of fostering innovation. The ultimate explanatory power of the model with all variables entered ($R^2 = .131$) is consistent with other research findings in corporate strategy and innovation (c.f., Brush and Bromiley 1997).

The following regression equation is used to estimate the determinants of innovation:

$$Inn = \beta_0 + \beta_1 TA + \beta_2 TQ + \beta_3 GS + \beta_4 RD + \beta_5 Ad + \beta_6 HCI \quad (1)$$

Table 3: Hierarchical Regression Analysis

| Variable | Step 1 (Controls) | Step 2 (R&D) | Step 3 (Advertising) | Step 4 (Average Retirement Support) |
|---|---|---|---|---|
| Total Assets | 0.06 | 0.04 | 0.04 | 0.00 |
| Tobin's Q | 0.23*** | 0.23*** | 0.23*** | 0.26*** |
| GS | 0.01 | 0.03 | 0.03 | 0.01 |
| R&D | | 0.08* | 0.06 | 0.02 |
| Advertising | | | 0.11** | 0.09* |
| Average Retirement Support | | | | 0.25*** |
| $R^2$ | 0.053 | 0.059 | 0.070 | 0.127 |
| Change in $R^2$ | 0.053*** | 0.006* | 0.011** | 0.057*** |

*The panels of this table show a stepwise regression, wherein predictor variables are added sequentially beyond initial controls. The results suggest that the inclusion of Average Retirement Support diminishes the importance of R&D and Marketing in predicting innovation and provides the largest explanatory power of the predictor variables that extend beyond the controls. Standardized betas are shown, GS = Good or Service. Significance levels are indicated as follows * p < 0.05, ** p < 0.01, *** p < .001*

## Managerial Implications

Our results have considerable relevance to practitioners in both goods and service sectors. Specifically, the findings suggest that firms competing on innovation should invest heavily in human capital (e.g., training, pay, and supplemental employee support) to entice, retain, and benefit from high quality employees. As companies continue to shrink and eliminate employee retirement support and other employment perks, the ability to maintain such benefits becomes rare, valuable, and not easily imitated (Barney 1991). Hence, investments in human capital represent a competitive advantage for firms. Further, the similarity of results across both goods and services industries implies that, irrespective of industry, managers need to recognize the importance of people in innovation efforts.

Managers also are cautioned to prevent overemphasizing research and development and marketing spending at the expense of employee support. A great deal of business and academic literature espouses the benefits of each in successful innovation, while ignoring other potential explanations such as human capital. This limited focus, unfortunately, fails to recognize the underlying reality that firms require high quality employees to generate innovation. Losing quality personnel as a function of poor compensation is expected to render innovation efforts less effective. Practitioners, therefore, are advised to seek greater balance between investments in human capital, research and development, and marketing.

Theoretical Implications

Human capital theory has a rich tradition in a variety of fields such as strategic management, organizational behavior, sociology, and economics (Becker 1964). However, many other research streams (e.g., innovation, services, and personal selling) which rely heavily on humans, have yet to give serious consideration to the importance of human capital investment. Researchers in these areas need to make greater strides toward adopting and adapting human capital theory to address innovation.

This research makes initial inroads into the theoretical bases of human capital accumulation as they pertain to innovation. Specifically, human capital investments are shown to generate superior innovation irrespective of industry. This finding is important to researchers, as it identifies a new, powerful, and more universal innovation driver than previously conceived. In addition, establishing the effectiveness of human capital as an innovation driver provides evidence for the importance of human capital theory (Becker 1962) to research and practice.

Limitations and Future Research

The research has several potential limitations. First, we measure human capital, organizational innovation, and organizational performance at an industry level. Such a perspective lends itself well to generalizability, as a multitude of different firms are included in the sample from both goods and services industries. Unfortunately, it also limits the extent to which more specific nuances of knowledge creation and usage can be assessed, as such analyses require information from inside firms (e.g., surveys of employees and managers). The current study provides a broad theoretic perspective, which aids in the generalizability of future research conducted in micro scale. Specifically, our research findings represent industry-wide (i.e., macro scale) support for the importance of human capital investments in innovation.

A firm can utilize differences in human capital expenditures to gauge its innovation efforts versus key competitors. However, it might be useful to know what combination of human capital, R&D, and marketing investments are an optimal mix for firms within given industries and what other firm-specific characteristics impact such calculations. For example, the extent of product customization, industry maturity, the extent of internationalization, and the average skill level of the labor pool may impact the ability of resources to be deployed. As a result, certain resources may become more important than others.

The variables selected for this study represent a second potential limitation. Despite the aggregate of the *Fortune* innovation rankings, they represent only one measure of innovation. Further, the measure is from an industry expert perspective rather than from an end user's perspective. Differences may exist when alternative sources are used for gauging innovation. Currently, *Fortune* represents one of the only widely available and known multi-industry set of innovation rankings. Similar research should use new measures of innovation as they become accepted. Despite this limitation, *Fortune's* Most Admired Companies list is recognized, respected, and utilized in both industry and academic research.

Classifying firms as goods or services via SIC code represents a final potential limitation in this research. While SIC codes are a valuable means of classification, firms may have multiple business units that include both goods and services. As a result, the primary SIC code identified for each company may not effectively distinguish goods from service firms. Future research should investigate alternative classification schema and revisit the potential similarities between goods and service firms posed in this research.

## CONCLUDING COMMENTS

The objective of this research was to examine the value of human capital as a predictor of innovation. More specifically, this research assessed the relative importance of human capital investments versus traditional investments in R&D and marketing. The research results suggest that human capital investments are powerful predictors of innovation. In addition, the results suggest that they provide a better, more universal explanation for innovation than traditional predictors. The effects are consistently positive across both goods and services industries.

Our sample consisted of 251 goods firms and 367 service firms that could be matched between the databases of COMPUSTAT and *Fortune* magazines. We used regression analysis to explain human capital investment's impact on innovation. Our findings indicated that, although significant, investment in R&D and marketing were not the potent in predictors of innovation that prior research contended (Mairesse and Mohnen 2002, and Song and Thieme2006, and Nijssen et al. 2006). Our findings suggested by adding human capital investment to the analysis that the variance explained by our model nearly doubled.

There are important theoretical and managerial implications from this work to consider. For example, theory is expanded by demonstrating that human capital investments are shown to generate superior innovation irrespective of industry. The primary managerial implications are straightforward: firms would be better served to invest more in developing employees and binding them to the organization by increasing retirement benefits and limiting excessive spending on both research and development as well as marketing.

Naturally, limitations to our findings exist. For example, measuring innovation at the industry level might overlook the intricacies of knowledge creation and its use within specific firms. Further, simply understanding that increasing human capital spending enhances innovation does not help firms actually strike the necessary balance between properly funding R&D, sales, and retirement investment. Future research should attempt to determine what that optimal ratio is.

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