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Deconstructing innovation in the wood furniture industry in Kenya

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ABSTRACT

Innovation is often considered to be a critical component of enterprise competitive advantage. Continuous innovation is necessary to allow firms to better meet consumer needs, stay ahead of the competition, capitalize on strategic market opportunities, and align organizational strengths with market opportunities. In this research, innovation was deconstructed into product, process, and business systems innovations. A model was then developed and used to examine the relationships between innovation constructs and demographic and management attributes of wood furniture firms in Kenya. Results show significant differences in product innovation between micro- and medium-size furniture firms, and between small- and medium-size firms. There were also significant regional differences in all innovation types. Overall, the most significant predictors of innovation were company location and rewards for implementing innovation. Other statistically significant innovation predictors were Internet use and research and development expenditures.

INTRODUCTION

The wood furniture industry in Kenya is an important socioeconomic sector in terms of employment, income, manufacturing sales, and value addition in both rural and urban economies throughout the country. However, it is among the manufacturing sectors which need governmental support to achieve Kenya's industrialization goal of transforming the economy into a newly industrializing country by 2030. The wood furniture sector is valued at approximately US$452 million annually (Creapo Oy 2015) although contributing to low value addition, estimated at about one percent annually over the last two decades (Ngui et al. 2016). We suggest that competitiveness in the sector can be improved by reducing factor inputs and value addition, and particularly, innovation.

Despite its role in the economy, furniture manufacturing in Kenya faces several challenges. For example, timber supply from industrial forests does not meet domestic demand, making the country a net importer of sawn timber from countries in the region (Creapo Oy 2015). In addition, limited labor skills due to inadequate training, and poor production facilities owing to lack of investment in new technologies, result in low productivity in the sector (KAM 2018). Domestic furniture firms are also beginning to face limited access to markets as a result of increasing competition from imports, particularly from mass market retail channels, and due to changing consumer buying habits. Consequently, with increasing regional and global competition, the furniture industry in Kenya is compelled to transform and improve the value-chain through innovation and value addition.

Kenya has the potential to improve its performance in the wood furniture sector if these challenges are resolved. In addition to addressing the problems of inefficient supply chains, lack of modern production technologies, and lack of marketing strategies, it is evident that the sector lacks a fundamental structure of innovation. This research addresses these underlying issues that have led to the lack of competitiveness of Kenya's furniture industry in the context of innovation.

THEORETICAL BACKGROUND

Innovation and innovativeness

Innovation is the ability to generate and execute new ideas. It is defined as the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations (OECD/Eurostat 2005). This study examined three types of innovation: product, process, and business systems innovation as defined by Hansen et al. (2014).

Product innovation refers to a good or service that is new or significantly improved, including significant improvements in technical specifications, components and materials, software in the product, user friendliness, or other functional characteristics such as reliability, quality, durability, affordability, and convenience (OECD/Eurostat 2018). Process innovation refers to a new or significantly improved production or delivery method, which could include significant changes in techniques, equipment and/or software used in the production process or service delivery. Forest sector companies have often excelled in this type of innovation given the high raw material input costs and a commodity or production mentality (Hansen et al. 2014).

Business systems innovation refers to the many activities that a company can use in business and marketing management that differ significantly from the firm’s earlier business processes, and which have been brought into use by the firm (OECD/Eurostat 2018). Characteristics of improved business functions include greater efficacy, resource efficiency, reliability and resilience, affordability, convenience, and usability for those involved externally or internally. An example is the adoption of a new customer relationship management module in a company’s enterprise resources planning software system (Hansen et al. 2014).

Innovativeness on the other hand is generally characterized as a function of adoption, creation, or a combination of the two (Hansen et al. 2014). An innovative firm tends to be an early adopter of new concepts, products, and technologies; tends to develop or create new ideas, concepts, and products; or some mix of the two. Innovativeness is therefore a characteristic, while an innovation is an outcome. Innovative companies therefore focus on the future and are seeking to adapt to a changing environment. Innovation is often considered as critical to a company's competitive advantage. It is argued that for a firm to maintain a competitive advantage, constant innovation is necessary to allow it to better meet consumer needs, stay ahead of the competition, capitalize on strategic market opportunities, and align organizational strengths with market opportunities (Wagner and Hansen 2005). Therefore, most innovation research assumes that innovation is a remedy to economic and social problems afflicting many economies. It is also assumed that innovation will support economic growth, make an entity, either a company or a country, more competitive and provide more jobs (Malerba 2004). Thus, in many countries, innovation policies have become a major component of economic policy (Kubeczko et al. 2006). The policies are intended to promote innovation and, as a result, increase national productivity and competitiveness. With innovation being a key challenge, such policies can play a similar role in improving the competitiveness of the furniture sector in Kenya.

The wood furniture sector in developing countries comprises mostly of low-tech and small and medium enterprises (SMEs), requiring assistance in enhancing innovativeness. Indeed, their innovative potential is very low in comparison to high-tech and large firms (Grzegorzewska et al. 2014). Small and medium enterprises may decide to work in partnership with other firms, share their competencies, reduce various costs, consolidate limited resources, and in this way increase their productivity, innovativeness, and profitability (Grzegorzewska et al. 2014).

Importance of innovation in the wood furniture industry

Many studies suggest that innovation is fundamental for achieving competitive advantage (Cao and Hansen 2006; Kusumawardhani and McCarthy 2013). In the past, firms have used different strategies to compete, such as efficiency approaches, quality movement, flexibility and, finally, innovativeness (Merx-Chermin and Nijhof 2005). This means that for firms to succeed they must be willing to innovate and develop innovation potential as the basic conditions to achieve competitiveness in the domestic and international markets (Biolcheva 2017). Due to these factors, many furniture producing countries have been forced to transform and advance the value chain through innovation and value addition to remain competitive.

When companies acknowledge that innovation has an effect on performance, it does not necessarily imply that every innovation has a positive impact (Otero-Neira et al. 2009). Innovative companies usually predict changes in the market and are able to provide solutions even before customers realize they need them. They also attract talented and innovative people and try to create a culture of innovation that encourages innovators to come up with creative ideas. This way, their brand stands out as unique in the market and they are able to meet their customer needs. Consequently, the company is able to increase its revenue in the long term.

Since the time of Schumpeter's (1942) pioneering contributions, innovation has been considered a multifaceted concept, whose meaning extends well beyond the narrow boundaries of technological innovation. One of the most common misconceptions is that innovation is primarily, if not exclusively about changing technology. However, innovation is not just about changing technologies. High-performing companies innovate by leveraging both new business models and improved technologies (Wharton School 2006). Successful examples of such innovations include the business models by Dell, technology and business model innovations of Apple, eBay's online business model for auctions, and Walmart's business model that integrates its supply chains with suppliers. Successful companies therefore combine technology change and business model change to create innovation (Wharton School 2006). Besides, to successfully integrate a robust model of innovation into the business mentality, companies must balance both the business and technology elements of innovation.

Examples of innovations in the wood furniture industry

Some of the recent innovations in business systems innovation include the use of Furniture 3D configurators, augmented reality (AR), and space planners to sell furniture products. Furniture retailers and sales representatives can use online 3D configuration apps to show their potential buyers all possible variations of their furniture products (IMM 2018). In this case you do not need a large showroom to show several models of sofas, as 3D configuration software allows you to showcase the whole range of your products with a laptop or tablet. In addition, the price of the product is calculated automatically as you add new materials or options, which saves time and simplifies the work of salespeople. The AR technology, in many cases, is an additional feature of 3D configurators, allowing the salespeople and the end buyers to place a virtual 3D model of furniture products in a real room in real time.

Another innovation for sales personnel is the space planners, which are very helpful for both manufacturers and retailers who deal with corporate clients like hotels. The software converts 2D blueprints into 3D models and gives a realistic impression of what the room or the whole apartment will look like (IMM 2018). You can then add realistic 3D furniture models, carpets, and other things. Manufacturers are also streamlining the shipment process and shifting to direct shipping. This will help reduce the shipping cost, both for customers and manufacturers.

In product innovation, the latest innovations include the production of portable furniture, easy to assemble furniture and furniture with inbuilt and invisible technology. Homeowners do not have to hire extra help or ask their friends to help them in moving their furniture within the house or even when relocating. The production of portable furniture makes it easy to change the setting of their home as well as conveniently shift their house. This is because portable furniture is light in weight, making it easy for everyone to move it around the house.

Another innovation in the furniture industry is the assembling of furniture. Assembly of the furniture pieces is now very easy and less time-consuming. Furthermore, most of the furniture offers several in-built technologies, such as LED light, USB ports, and charging capability. The furniture has not only inbuilt technology, but it is invisible as well such as tables that have a concealed charging device.

Furniture manufacturers are also producing smaller profile furniture for many customers who have smaller living spaces. The small living spaces also gave rise to multifunctional furniture. Since the living space is limited, people want to have furniture that can perform multiple tasks. Hence, the furniture is not only versatile but ergonomic as well.

In process innovation, advanced cutting machinery using smarter production is one of the most significant innovations that has impacted furniture manufacturing (Chrinian 2017). Capable of processing a variety of materials from wood to plastics and composites, computer-controlled cutting machines known as CNC routers allow furniture manufacturers to create products with greater precision, speed, and quality. This computer-controlled machinery has enabled manufacturers to save valuable time and money and can have a positive impact on a company's customer service.

Factors that influence innovativeness in the furniture sector

There are many factors that can influence the innovativeness of a company. Schumpeter (1942) hypothesized that large firms have an advantage over small firms as they have more resources to support innovation. It has now been confirmed from research that firm size can potentially play a positive or negative role in firm innovativeness, depending on the specifics of the situation. Larger firms tend to be more process innovative (Crespell et al. 2006), and generally, large firms focus more on process innovation, while smaller firms focus on product and business systems innovation, where they can excel even with limited resources (Wagner and Hansen 2005). Other studies have shown that average value of innovations varies systematically with firm size. Large companies are responsible for most high-value innovations, while lower-value innovations are introduced by smaller businesses (Heimonen 2012). These studies indicate that there is a significant link between innovation, firm size, and growth. The recommendation for smaller companies is to carefully recognize the level of process innovation to be competitive and invest remaining resources in other areas of innovation (Wagner and Hansen 2005). Focusing on furniture companies, Barčić et al. (2011) found a positive connection between company size and process and business systems innovation, but not product innovation.

Location has also been suggested to have some influence on a firm's innovativeness. Ferreira et al. (2017) found company location to have a positive influence on company innovation due to proximity to product and labour markets. However, Heimonen (2012) concludes that whereas some studies have shown regional differences in firms' innovativeness and performance, others found few or no regional differences in innovation and performance. Locational factors that may play a role in innovativeness include human capital, labor skills, population density, manufacturing wages, taxes, and unemployment rate (Audretsch and Fritsch 1999).

Grzegorzewska et al. (2014) note that cluster innovation can be a major factor in attaining innovativeness. Cluster innovation is described as a collaborative innovation process of specialized enterprises in the same or related industries that cooperate with suppliers, customers, marketing network, government, and other actors in the cluster. It is argued that because of geographic proximity, firms in clusters are under strong competitive pressure, which stimulates innovation among them.

This is also seen as the reason that innovation often occurs locally whereas its benefits spread more widely through productivity gains. Therefore, some researchers suggest that firms in the cluster have potential to be more innovative than others because they benefit from agglomeration economies such as nearby suppliers attaining efficient scale, direct observation of competitors, and ability to exploit collective knowledge (Grzegorzewska et al. 2014). Moreover, firms in clusters also benefit from network-based effects, especially enhanced social interaction and have more opportunities to get in touch with customers and be aware of new customers' needs more clearly and more quickly.

Culture has also been studied as a key factor that influences innovation. National culture has been related to various aspects of innovation such as differences among countries in invention and innovation rates, R&D productivity, and entrepreneurship (Rosenbusch et al. 2011). Studies have shown that cultural differences may influence the relationship between innovation and performance due to their impact on innovation input, innovation process, and commercialization of innovations. Individualism and collectivist cultures are considered the most central with respect to innovation management and venture creation processes (Tylecote 1996; Mitchell et al. 2000). People in an individualistic culture are motivated by personal goals whereas people in collectivist cultures try to subordinate their personal goals to the goals of their group. For example, individualism may facilitate new product development at the invention stage but may not be beneficial at the implementation of innovation once the initial invention stage is completed and the new product or service needs to be brought to market. Collectivism in contrast fosters social interactions and cooperative team behavior (Eby and Dobbins 1997) and should therefore be beneficial during the commercialization stage.

Other factors that were cited in a case study of a small, secondary wood products company in Oregon were fear of change, ineffective management, and poor communication as challenges to being innovative (Crespell and Hansen 2008). In Maine, the lack of cooperation from other actors in the innovation system, including landowners, logging contractors, and biomass consuming facilities, creates a formidable barrier to innovation (Stone et al. 2011). The price of biomass and the cost of the particular innovation are also key influencers that impact adoption decisions. In addition, financial limitations are seen as the most significant limitation to innovation by Oregon companies, followed by the poor state of the economy, lack of time, lack of workforce, and interference from the government (Orozco et al. 2013).

Measuring innovativeness in the forest products industry

Measurement of innovation is not a straightforward task and remains in its infancy in both developed and developing countries (Pham 2010). Because of this shortcoming, researchers are trying to devise comprehensive methods of measuring innovation. For instance, the U.S. Department of Commerce created the Advisory Committee on Measuring Innovation in the 21st

Century Economy. The Committee pointed out the key indicators of innovation as intellectual property (IP) and expenditure on research and development (R&D). It was noted that sufficient data is required to adequately measure innovation. These data include R&D expenditure, information on innovation, and innovation strategies (Pham 2010). However, data collected by government statistical agencies, private-sector organizations and firms are in many cases limited, incomplete and understated substantial sources of innovation in an economy. To overcome this shortcoming in the United States, the Census Bureau conducts an annual firm-level survey of industrial R&D.

Since R&D is an important contributor to economic growth and is a critical factor in determining the competitiveness of firms, it is used as a reliable measure of innovative capacity. Pham (2010) also notes that innovation is more sensitive to R&D in low-tech than in high-tech sectors. Intellectual property on the other hand stimulates R&D expenditure in firms, which creates a catalyst for innovation that leads to higher sales and outputs, and consequently firms are expected to improve their competitiveness. As a result, IP-intensive firms which are traditionally capital intensive, have increased outputs, increased sales, and hire more employees.

Measuring innovativeness may enable many companies to benchmark against other companies or among units in their own organization, or to track progress in efforts to enhance innovativeness (Hansen et al. 2014). Some scholars have developed measures of innovativeness to help in achieving this goal. There are basically two methods employed. The first is that outlined by Rogers (2003), where the more innovations a firm has adopted, the more innovative it is considered; and the second is a self-report evaluation based on multiple items either directly describing innovativeness or referring to the propensity of a firm to create and/or adopt innovations. These self-reports are generally based on the three basic types of innovation: product, process and business systems (Knowles et al. 2008a; Barčić et al. 2011; Crespell et al. 2006). The Oslo Manual also outlines measurement guidelines for innovation which most governmental studies of innovation typically follow (Anderson 2006).

A scale developed in the forest sector literature is an innovativeness scale developed around six dimensions, the propensity to create products, processes and business systems and the propensity to adopt products, processes, and business systems. The scale was developed via two separate data collection efforts (Knowles et al. 2008a; 2008b) and further validated with data from another study by Crespell et al. (2008). The scale comprises the three basic constructs of innovation (product, process, and business systems) with 15 items and has been used to measure innovativeness in several different countries (Hansen et al. 2011). Barčić et al. (2011) follow a similar dimensional approach to measure innovation but employ a different set of items.

Another popular measure of innovation in many firms is the percentage of revenue from new products. This measure is appealing because it is quantitative and implies a rate of regeneration (Shapiro 2006). It is easier to understand this measure if it is associated with specific products or processes when it is derived from the Enterprise Resource Planning (ERP) system. However, the percentage revenue measure presents some inherent complexities. The first complexity is to clearly tell how new the product or process is. Any conscientious use of percent of revenue from new products demands considerable effort in determining what threshold of change constitutes newness (Shapiro 2006). The second complexity is to tell how long before new is old. A timeframe should be defined when new innovations cease to constitute innovation in the percentage of revenue from new products. The last complexity is to tell the kind of innovation being measured. However, Shapiro (2006) concludes that it is a good measure of innovation if it is applied consistently without the bias toward one type of innovation over all others.

In summary, this study uses the three innovation constructs (product, process, and business systems) as the basis for analyzing innovation in the furniture sector in Kenya. A theoretical framework of innovation is developed following the approaches by Barčić et al. (2011) and Barčić et al. (2016) to analyze innovation in furniture firms and identify opportunities for the sector to improve its competitiveness.

OBJECTIVES AND HYPOTHESIS

The research objectives were to:

(i) Characterize innovations in wood furniture firms into three types: product, process, and business systems innovations.

(ii) Determine innovation relationships to demographic and management attributes (company age, company size, location, age of employees, education level of employees, company flexibility, Internet use, and research and development).

The following hypotheses were tested to determine the relationships between the respondent demographic indicators and the three subcomponents of innovation:

H1a: There is a positive relationship between company size and product innovation.
H1b: There is a positive relationship between company size and production process innovation.
H1c: There is a positive relationship between company size and business systems innovation.

H2a: There is a positive relationship between company location and product innovation.
H2b: There is a positive relationship between company location and production process innovation.
H2c: There is a positive relationship between company location and business systems innovation.

H3a: There is a negative relationship between age of employees and product innovation.
H3b: There is a negative relationship between age of employees and production process innovation.
H3c: There is a negative relationship between age of employees and business systems innovation.

H4a: There is a positive relationship between education of employees and product innovation.
H4b: There is a positive relationship between education of employees and production process innovation.

H4c: There is a positive relationship between education of employees and business systems innovation.

H5a: There is a positive relationship between research and development activities and product innovation.
H5b: There is a positive relationship between research and development activities and process innovation.
H5c: There is a positive relationship between research and development activities and business systems innovation.

H6a: There is a positive relationship between company flexibility and product innovation.
H6b: There is a positive relationship between company flexibility and process innovation.
H6c: There is a positive relationship between company flexibility and business systems innovation.

H7a: There is a positive relationship between Internet use and product innovation.
H7b: There is a positive relationship between Internet use and process innovation.
H7c: There is a positive relationship between Internet use and business systems innovation.

H8a: There is a positive relationship between age of company and product innovation.
H8b: There is a positive relationship between age of company and process innovation.

H8c: There is a positive relationship between age of company and business systems innovation.

THE RESEARCH MODEL

The study follows the models used by Barčić et al. (2011) and Barčić et al. (2016) to examine innovation in the US and Croatia furniture industries, respectively. They are generalized models which can be used in other settings and were chosen because they provide a straightforward framework for analyzing the relationships between demographic and management attributes and the three innovation constructs of product, process, and business systems innovation (Figure 1).

This study applies the models to Kenya, which is a developing country, and makes comparisons to Croatia and the US. The variables in the models were grouped into three categories.

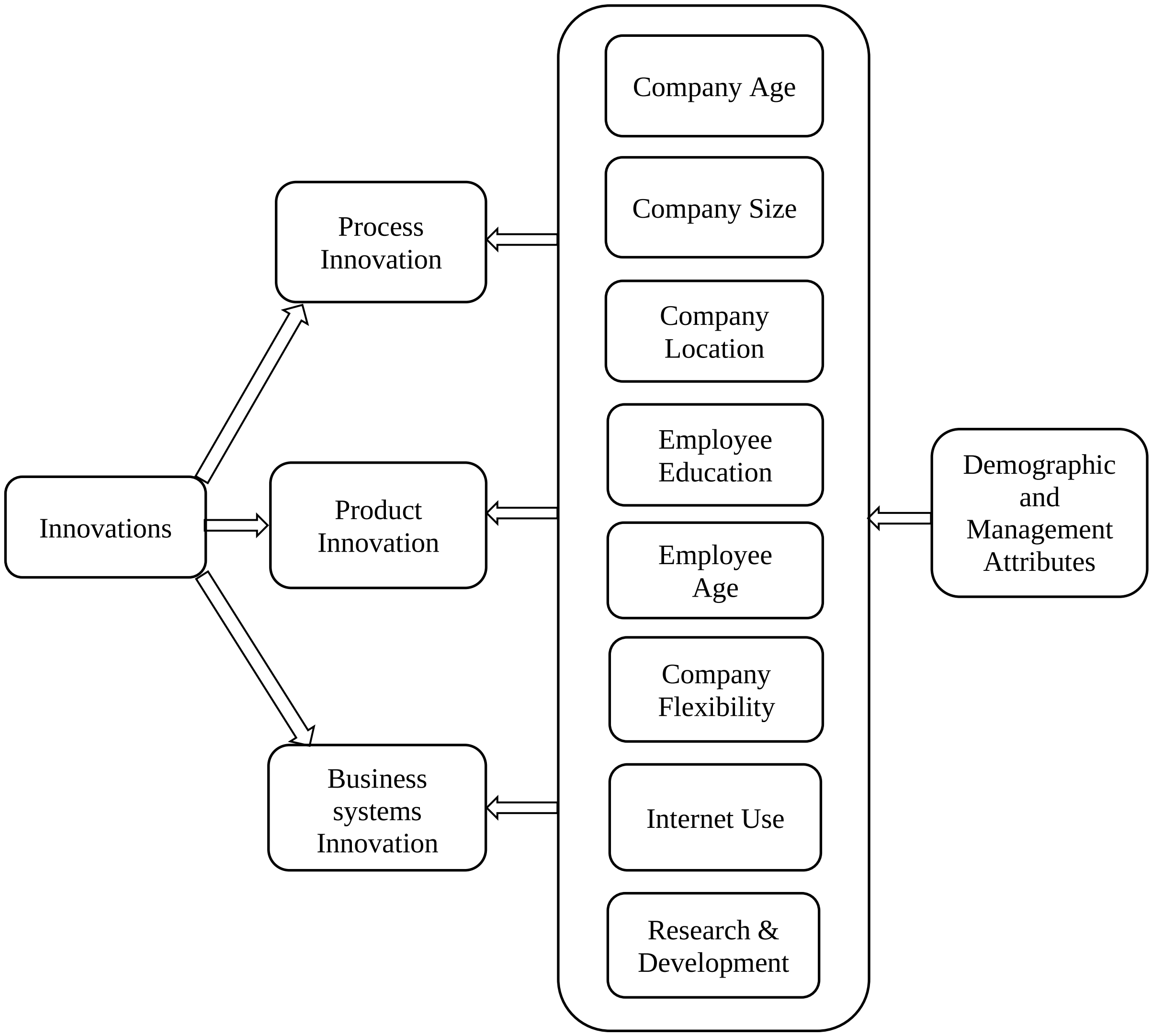

Figure 1. Model of the framework for testing the relationship between innovation types, and demographic and management attributes (Adapted from Barčić et al. 2011).

The first category of demographic drivers is the internal firm factors which include but not limited to years in business, characteristics of production processes, number of employees, structure of employees (age and education), number and age of large capital item manufacturing machines, Internet usage, promotion methods, company flexibility, and proportion of revenue from new or improved products. The second category is external firm factors which comprises company location, firm suppliers, and customers. The last category is innovation types which comprises product innovation, production process innovation and business systems innovation.

Innovation was measured using the following elements: revenue from sales due to adoption of new innovations (assessed in percentage), and company flexibility in adopting product innovation, process innovation and business systems innovation. Other measures included responses to issues related to innovation capacity development such as setting aside funds for research and development (R&D), rewards for innovations, and early adoption of new innovations.

Research design

This study used face-to-face interviews with owners or managers of wood furniture manufacturing firms in the cities of Eldoret, Kisumu and Nairobi in Kenya. These cities were selected as research sites because of their significant role in the furniture manufacturing industry, and because they are among the major centers for wood furniture enterprises in the country. The locations of the three cities are shown on the Kenyan map (Figure 2). Most of the wood furniture enterprises are located in Nairobi, which is the capital city and has more developed infrastructure compared to the other two cities. However, Kisumu and Eldoret also have vibrant furniture enterprises and are likely to expand rapidly due to current improvements in infrastructure and fast growth in population (Creapo Oy 2015).

The research sites chosen for this study were centers where furniture firms were in clusters. In Eldoret, the clusters were in Langas and in Kimumu; in Kisumu, the cluster was in Kibuye; and in Nairobi, the clusters were in Ngong, Gikomba, and Industrial area.

- Study sites

Figure 2. Study sites in Eldoret, Kisumu and Nairobi cities in Kenya.

Data collection

The development and implementation of the survey questionnaire for this study follows methods and procedures recommended by Dillman et al. (2014). The questionnaire was pre-tested by face-to-face interviewing of eight managers of furniture firms, four in Eldoret and four in Kisumu. All the responses were satisfactory and no revision to the survey questionnaire was required. Data was then collected through in-person interviews of managers or owners of furniture manufacturing firms in the three cities from May to July 2018. The respondents were selected randomly from a cluster of furniture enterprises in the study sites.

The questionnaire was divided into three sections. The first section sought general company information such as location, company size, company sales, gender of employees, and the number and education level of employees. Company size was based on number of employees and gross sales from furniture by the company.

The second section sought information on company operations such as type of production processes, number, age and type of manufacturing machines, market share, and the use of computer software in production. The last section sought information on marketing of company products such as market research, use of the Internet, raw material suppliers, promotion of company products, factors influencing company success, and company flexibility.

The questionnaire consisted of fixed response, open-ended, and scale questions. Some responses were binomial (yes/no) while others were multi-choice responses. In the third section, responses on the attitudes of respondents about various aspects of innovation were determined using a five-point Likert scale, which although not a continuous distribution, can be used as such for analytical purposes when anchored on extremes with a neutral point and does fulfil in part the continuity requirement (Byrne 2010). The item scales in the study were recorded on a scale of 1 (strongly disagree) to 5 (strongly agree), or 1 (very unimportant) to 5 (very important). Company location was based on population and was recorded on a scale of 1 (rural area with less than 2,500 people) to 6 (very large city with 1,000,000 or more people).

Data analysis

Descriptive analysis was done to describe the demographic and management attributes of the furniture firms. Factor analysis using principal component analysis with varimax rotation was used to reduce the demographic and management items into a fewer number of factors (constructs) for testing the hypotheses. Summated scales following the data reduction were used for correlation analysis, analysis of variance and regression analysis.

RESULTS AND DISCUSSION

Response rate

The target sample was 160 furniture firms. However, a total of 111 firms were interviewed, and 104 firms provided usable responses for the study. An adjusted response rate of 65% achieved for this study was considered more than adequate given that response rates for industrial studies typically range between 15% and 30%.

Firm characteristics

All the furniture firms that participated in this study were privately owned by Kenyans, and a majority of them (45%) were within the 1-5-year age bracket. The mean age of all firms was 10 years, and the oldest firm was 83 years old. Overall, the results show an increasing trend in the number of furniture firms entering the industry over the last two decades. The three cities have been experiencing industrial growth and hence the increased demand for both household and office furniture (Creapo Oy 2015).

The firms were categorized as micro, small and medium firms based on the European Commission (2015) classification which is based on annual revenue, number of employees, and annual total assets. In this study, annual gross revenue is used because it makes it possible to make comparisons after adjusting for a country's economy (Bloem 2012). A majority of respondent firms (93%) were micro enterprises, 4% were classified as small enterprises and 3% were classified as medium enterprises.

Most employees (94%) were male, revealing that the furniture industry in Kenya is male dominated. A majority of the firms (79%) had a workforce comprising less than 11% female employees compared to 75% of the firms which had a workforce comprising 90% male employees.

In terms of age, a majority (59.6%) were young employees in the 20-30-year age bracket and overall, 89% of the employees were below the age of 40 years. 45% of the employees had had some high school education or less, 39% were high school graduates and only 13% had been to college but did not complete training. 3% of the employees were college graduates and less than 1% were university graduates. These findings indicate that the majority of employees enter the furniture industry in Kenya without prior training and instead rely on on-the-job training to acquire the requisite skills. Short-term training may be required to improve the skills and performance of new employees.

Furniture production processes

Band saws, routers, planers, and drill presses were the most prevalent in at least 40% of the firms. About 65% of the firms had between one and five large capital machines, while only 2% of the firms had more than 15 large capital machines. About 69% of the large capital item manufacturing machines were in the 1-5-year age bracket.

Batch and one-of-a-kind production processes were reported by all respondents as the main production processes they use to meet customer demands. A few respondents reported large-scale production processes (24%) and limited-edition production processes (15%). Only 10% of the respondent firms did all the stages of product manufacturing on their own, while 86% subcontracted some stages of production. The production stages subcontracted were moulding, curving, planing, grooving, and cutting.

The majority of the respondents (97%) worked with customers to improve designs of existing products, while 98% worked with customers to develop new product designs. The tendency of customers giving product specifications made one of a kind production process popular among micro enterprises.

Less than 3% of the respondents used computer software in management and in the manufacture of their products. Only 2% were using computer aided design (CAD) machines while 3% were using computer numerical control (CNC) machines. In management, 3% of the respondents were using 3D visualization to market their products to customers, 2% were using software to manage or schedule jobs, and 5% were using software to estimate production job costs.

Most respondent firms (88%) did not have a company website. A few firms used the Internet for emails (12%), price inquiry (9%), product inquiry (6%) and sales (5%). Other Internet uses reported by less than 5% of the respondents included ordering from suppliers, quality analysis, order processing, and shipping notices.

On innovation, 13% of the respondents often introduce a new product into the market before their competitors while 86% sometimes introduce new products before their competitors. In addition, 32% of the respondents introduce a new product into the market that is already available with their competitors. A majority of the firms (69%) were somewhat flexible, while 31% were very flexible in adopting new technologies to remain competitive in the market.

About 39% of the respondents reported that sales revenues from new or improved products were between 6% and 10% of their total revenue. Only 6% of the respondents were receiving between 26% and 30% of their revenue from new or improved products. The mean revenue from new or improved products was 13% with standard deviation of 6.8%, and a maximum of 30%.

Innovation deconstruction

Factor analysis was used for data reduction and to group items into unified factors (Pituch and Stevens 2016; Johnson and Wichern 2001). As discussed earlier in the literature, three main types of innovations were identified in the forest products industry (Hansen et al. 2014; Cao and Hansen 2006; Barčić, et al. 2011). Based on these three innovation constructs, the number of factor dimensions was predetermined and fixed at three for factor analysis. The factor components extracted explained 40.78% of the total variance of the dataset. Using the factor loading threshold of ≥ 0.50, each of the constructs had five items (Table 1).

The Cronbach's alpha calculated for the innovation constructs were 0.75 for business systems innovation, 0.72 for process innovation, and 0.72 for product innovation (Table 2). These values were also higher than the ≥ 0.60 threshold and were therefore considered good measures of reliability and internal consistency of the items. Summated scales for each construct were therefore used in subsequent correlation and regression analysis.

Table 1. Factor analysis solution matrix for innovation constructs.

	Business systems innovation	Process innovation	Product innovation	Communalities
High level of overall customer service	0.794			0.678
Fast response to customer inquiries	0.786			0.664
Product availability	0.678			0.476
Knowledgeable salespeople	0.599			0.399
Company reputation	0.552			0.373
Flexible delivery terms	0.479			0.319
Distribution capabilities	0.417			0.369
Production equipment has improved		0.693		0.489
We have become more competitive		0.690		0.487
Research and development investments increased		0.656		0.431
A major improvement in current technology		0.593		0.392
Use of breakthrough production technology		0.530		0.416
Cutting-edge designs			0.755	0.592
Production software has improved			0.723	0.542
Internet web site			0.590	0.403
Are award winning designs			0.567	0.362
Unique products not found elsewhere in the market			0.506	0.457

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
Loadings < 0.4 not shown; (n =104)

Table 2. Scale reliability (Cronbach's Alpha) and homogeneity (average inter-item correlation) analysis for innovations constructs.

	Business systems innovation	Process innovation	Product innovation
Cronbach's alpha	0.75	0.72	0.72
Inter-item correlations	0.41	0.34	0.36
n	104	104	104
Number of variables	5	5	5
Item means	3.8	3.0	1.6
Std. deviation	2.2	2.5	2.8

Correlation analysis

Correlation analysis was done between the three innovation constructs and demographic and management attributes to test the hypotheses. Two factors, revenue from new or improved products and rewards for innovations, were included in the analyses although they were not in the hypotheses. A Pearson correlation analysis revealed that business systems innovation has significant positive correlations with Internet use and age of company (Table 3). The correlations were consistent with hypotheses H7c and H8c.

Table 3. Correlations between innovation constructs and demographic and management attributes (n=104).

		Business systems innovation	Process innovation	Product innovation
Age of company	Pearson Correlation	0.240*	0.240*	0.499**
	Sig. (2-tailed)	0.014	0.014	0
Company location	Pearson Correlation	0.173	0.218*	0.573**
	Sig. (2-tailed)	0.079	0.026	0
Company size	Pearson Correlation	0.136	0.130	0.558**
	Sig. (2-tailed)	0.169	0.188	0
Education of employees	Pearson Correlation	0.041	0.013	0.143
	Sig. (2-tailed)	0.676	0.9	0.148
Age of employees	Pearson Correlation	0.021	0.206*	0.309**
	Sig. (2-tailed)	0.832	0.036	0.001
Company flexibility	Pearson Correlation	0.086	0.16	0.334**
	Sig. (2-tailed)	0.386	0.105	0.001
Revenue from new or improved products	Pearson Correlation	0.125	0.176	0.335**
	Sig. (2-tailed)	0.205	0.075	0.001
Research and development	Pearson Correlation	0.008	0.639**	0.086
	Sig. (2-tailed)	0.935	0	0.387
Internet use	Pearson Correlation	0.257**	0.127	0.249*
	Sig. (2-tailed)	0.009	0.198	0.011
Rewards for innovations	Pearson Correlation	0.183	0.067	0.035
	Sig. (2-tailed)	0.063	0.499	0.726

*Note: ** Correlation is significant at the 0.01 level (2-tailed); * Correlation is significant at the 0.05 level (2-tailed).*

Process innovation had significant positive correlations with company location, age of employees, research and development, and age of company. The correlations were consistent with hypotheses H2b, H3b, H5b and H8b. Barčić et al. (2016) found significant positive correlations between process innovation and Internet use, company flexibility, and research and development in

Croatian furniture firms. In the case of US furniture firms, only company size had a significant positive correlation with process innovation (Barčić et al. 2011).

Product innovation had significant positive correlation with company size, company location, age of employees, company flexibility, Internet use, age of company, and revenue from new or improved products. These were also consistent with hypotheses H1a, H2a, H3a, H6a, H7a and H8a. Barčić et al. (2011) did not find significant correlations between product innovation and company size, age of employees, and company location in the US. However, Barčić et al. 2016 found a significant positive correlation between product innovation and research and development, company flexibility, and Internet use in Croatian furniture firms.

Education level of employees was not correlated with any of the three constructs. In the study of US furniture firms by Barčić et al. (2011), education level was found to have a negative significant relationship with process innovation. This may imply differences in job training between Kenya and the US. A majority of employees (84%) in the Kenyan furniture firms had high school or less level of education.

When considering all innovation constructs, age of company was the only variable with significant positive correlations with product, process, and business systems innovation. The results show that a majority of the firms (68%) were less than 10 years old. The age of a firm indicates its overall accumulated experience over time. Older firms may have gained a larger stock of knowledge than younger firms on how to implement change and obtain results from investments. The knowledge accumulated over time can influence both the ability to innovate and innovation outcomes (OECD/Eurostat 2018).

Age of employees and company location were both correlated positively with process and product innovation while internet use was positively correlated with product and business systems innovation. Lastly, company size had a positive correlation with product innovation while research and development were positively correlated with process innovation.

Differences in innovation by company size and location

Innovation constructs were compared among micro, small, and medium enterprises using analysis of variance (ANOVA). Table 4 shows that only product innovation is significantly different between micro and medium firms, and between small and medium firms ($p<0.05$). However, there is no significant difference between micro and small firms in product innovation.

Table 4. Differences in innovation by company size (ANOVA).

Dependent Variable	Company size		Mean difference	Sig.
Business systems innovation	Micro (3.75)	Small (3.70)	0.05	1.00
		Medium (4.20)	-0.45	0.26
	Small (3.70)	Medium (4.20)	-0.50	0.43
Process innovation	Micro (3.03)	Small (3.05)	-0.02	1.00
		Medium (3.47)	-0.44	0.42
	Small (3.05)	Medium (3.47)	-0.42	0.84
Product innovation	Micro (1.51)	Small (1.70)	-0.19	1.00
		Medium (3.53)	-2.02*	0.00
	Small (1.70)	Medium (3.53)	-1.83*	0.00

*Note: * The mean difference is significant at $\alpha = 0.05$; (n=104)*

Based on the mean differences, medium firms are more innovative than small and micro firms in product innovation. Wagner and Hansen (2005) have found that firm size significantly impacts the innovation type pursued in the wood products industry. Large companies tend to invest intensively in state-of-the-art facilities to maintain an edge in process innovation. Small companies on the other hand level the field with the larger companies by considering all three innovation types.

Analysis of variance was also used to compare innovation constructs among firms in the three locations (Eldoret, Kisumu and Nairobi). The results show significant differences in all the three innovation constructs between Eldoret and Nairobi (Table 5). There is also a significant difference in process innovation between Eldoret and Kisumu, and in product innovation between Kisumu and Nairobi. The results further indicate that there are no significant differences in business systems and process innovation between Kisumu and Nairobi. Similarly, Eldoret and Kisumu do not differ significantly in product innovation.

Table 5. Differences in innovation by company location (ANOVA).

Dependent variable	Company location		Mean difference	Sig.
Business systems innovation	Eldoret (3.57)	Kisumu (3.82)	-0.25	0.05
		Nairobi (3.86)	-0.30*	0.02
	Kisumu (3.82)	Nairobi (3.86)	-0.04	1.00
Process innovation	Eldoret (2.79)	Kisumu (3.11)	-0.32*	0.02
		Nairobi (3.19)	-0.40*	0.00
	Kisumu	Nairobi (3.19)	-0.08	1.00
Product innovation	Eldoret (1.41)	Kisumu (1.28)	0.13	0.75
		Nairobi (2.01)	-0.59*	0.00
	Kisumu (1.28)	Nairobi (2.01)	-0.72*	0.00

*Note: * The mean difference is significant at $\alpha = 0.05$; (n=104)*

Regression analysis

Regression analysis was performed to examine the relationship between the three innovation constructs (dependent variables) and the demographic and management attributes. Summated scales of the innovation constructs (business systems, process, and product innovation) were used as independent variables in regression analysis with ten demographic and management factors as independent variables.

Backward multiple regression was used, which uses a backward elimination process to identify the best set of variables that most explain the variability in the dependent variable. The analysis starts with a full model and at each step gradually eliminates variables from the regression model to find a reduced model that best explains the data. The final model arrived at when there are no variables in the equation with a p value greater than or equal to 0.10 (Pituch and Stevens 2016).

The coefficients in the final models provided the best predictors for each innovation construct (Table 6). Business systems innovation is best explained by rewards for innovations, Internet use, and company location ($F(3,100) = 5.71$, $p<0.001$). The estimated model for business systems innovation explains approximately 14% of variance in the dependent variable. Seven independent variables were eliminated from the full model and predictive equation for the measure of business systems innovation is:

Business systems innovation = 1.420 + 0.275 (Company location) + 0.153 (Rewards for innovations) + 0.180 (Internet use)

Table 6. Regression coefficients for the business systems innovation, process Innovation and product innovation models.

	Unstandardized coefficients		Standardized coefficients			Collinearity statistics	
	B	Std. Error	Beta	t	Sig.	Tolerance	VIF
Dependent Variable: Business Systems Innovation							
Constant	1.420	0.641		2.217	0.029*		
Company Location	0.275	0.093	0.296	2.950	0.004**	0.846	1.182
Rewards for innovations	0.153	0.085	0.198	1.799	0.075	0.708	1.413
Internet use	0.180	0.081	0.229	2.214	0.029*	0.802	1.247
Dependent Variable: Process Innovation							
Constant	-0.165	0.566		-0.291	0.772		
Company Location	0.330	0.081	0.315	4.072	0.000***	0.846	1.183
Rewards for innovations	0.130	0.068	0.149	1.926	0.057^{m}	0.845	1.183
Research and development	0.477	0.053	0.648	9.082	0.000***	0.994	1.006
Dependent Variable: Product Innovation							
Constant	-3.310	0.604		-5.480	0.000***		
Company Location	0.668	0.092	0.578	7.240	0.000***	0.707	1.415
Company size	0.442	0.115	0.304	3.855	0.000***	0.724	1.381
Rewards for innovations	0.131	0.077	0.136	1.694	0.093	0.699	1.430
Internet use	0.191	0.080	0.195	2.399	0.018*	0.683	1.464

*Note: * Significant at α = 0.05; * * Significant at α = 0.01; * * *Significant at α = 0.001; m Marginally significant; (n=104).*

Process innovation is best explained by company location, rewards for innovations, and research and development ($F(3,100) = 32.41$, $p<0.001$). Seven independent variables were eliminated from the full model and the predictive equation for the measure of process innovation is:

Process innovation = -0.165 + 0.330 (Company Location) + 0.130 (Rewards for innovations) + 0.477 (Research and development)

Product innovation is best explained by company location, company size, rewards for innovations, and Internet use ($f(4,99) = 30.76$, $p<0.001$). Six independent variables were eliminated from the full model and the predictive equation for the measure of product innovation is:

Product innovation = -3.310 + 0.668 (Company Location) + 0.442 (Company size) + 0.131 (Rewards for innovations) + 0.191 (Internet use)

The regression results were consistent with some of the significant correlation relationships between the innovation constructs and the demographic and management attributes. However, there are some discrepancies. Age of the company which was correlated with all the three constructs is eliminated in regression analysis, but company location remains a key variable that explains variability in the three constructs. Rewards for innovations that was not correlated with any of the three innovation constructs also becomes a key variable that explains variability in all the innovation types in the regression analysis. Murat Ar and Baki (2011) argue that managers should motivate their employees with supportive activities such as incentives and rewards because they are one of the most important sources of innovations. The results show that only 7 out of the 24 hypotheses tested were supported by both the correlation and regression analyses (Table 7).

Table 7. Summary results of hypotheses tests for the three subcomponents of innovation.

Hypotheses	Demographic/ management attribute	Bivariate correlation	Multiple regression	Directionality as hypothesized
H1a	Company size	Supported	Supported	Yes
H1b	Company size	Not supported	Not supported	Inconclusive
H1c	Company size	Not supported	Not supported	Inconclusive
H2a	Company location	Supported	Supported	Yes
H2b	Company location	Supported	Supported	Yes
H2c	Company location	Not supported	Supported	Yes
H3a	Age of employees	Supported	Not supported	Inconclusive
H3b	Age of employees	Supported	Not Supported	Inconclusive
H3c	Age of employees	Not supported	Not supported	No
H4a	Education of employees	Not Supported	Not supported	Yes
H4b	Education of employees	Not supported	Not supported	Inconclusive
H4c	Education of employees	Not supported	Not supported	Inconclusive
H5a	Research & development	Not supported	Not Supported	Yes
H5b	Research & development	Supported	Supported	Yes
H5c	Research & development	Not supported	Not supported	Inconclusive
H6a	Company flexibility	Supported	Not supported	Yes
H6b	Company flexibility	Not supported	Not supported	Yes
H6c	Company flexibility	Not supported	Not supported	Inconclusive
H7a	Internet use	Supported	Supported	Yes
H7b	Internet use	Not supported	Not supported	Inconclusive
H7c	Internet use	Supported	Supported	Yes
H8a	Age of company	Supported	Not supported	Yes
H8b	Age of company	supported	supported	Yes
H8c	Age of company	Supported	Not supported	Yes

Note: a = product innovation; b = process innovation; c = business systems innovation

SUMMARY

This study deconstructed innovation in the wood furniture industry in Kenya into three constructs: product, process, and business systems innovations. Results from the deconstructed model supported some of the hypotheses:

(i) Business systems innovation has significant positive correlations with age of company and Internet use.

(ii) Process innovation has significant positive correlations with age of company, company location, age of employees, and research and development.

(iii) Product innovation had significant positive correlation with age of company, company location, company size, age of employees, company flexibility, revenue from new or improved products, and Internet use.

(iv) The best predictors of business systems innovation were company location, rewards for innovations, and Internet use.

(v) The best predictors of process innovation were company location, rewards for innovations, and research and development.

(vi) The best predictors of product innovation were company location, company size, rewards for innovation, and Internet use.

These results may help owners of wood furniture firms and the government to understand the importance of the demographic and management attributes in improving innovation and competitiveness of the furniture sector in Kenya.

CONFLICT OF INTERESTS

The authors declare no conflict of interest.

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