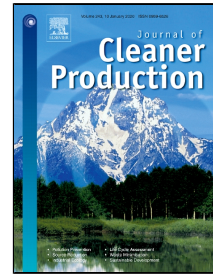


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The Relationship among Customer Operant Resources, Online Value Co-creation and Electronic-Word-of-mouth in Solid Waste Management Marketing

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Abstract

In recent times, waste management has engaged the attention of governments, policy makers, and academics as it has ramifications for the health and well-being of citizens, the environment, and the economy. In this regard, waste management firms and policy makers are employing strategic approaches to waste management efforts by empowering relations among various stakeholders to innovate. Thus, customer and stakeholder value co-creation is one such strategic approach waste management firms can adopt to create value and to brand. Previous studies of co-creation in waste management are largely broad in perspective. The purpose of this study is, therefore, to assess the relationship among customer operant resources, online value co-creation and digital branding through electronic word-of-mouth in the Ghanaian waste collection industry. Using the positivist research paradigm approach, a structured questionnaire was used to collect data from customers through social media platforms. Hierarchical multiple regression was used to test the hypotheses. The relationships among customer operant resources, co-creation and electronic word-of-mouth were all significant. Customer value co-creation positively mediates between customer operant resources and electronic word-of-mouth. Firm web-based platforms also positively moderate the effects of customer operant resources on customer online value co-creation. The results of the study can guide management of the firms to design appropriate strategic and educational programs for the customers. This study has advanced knowledge on the importance of customer operant resources in waste management value co-creation by demonstrating the degree of impact of each of these customer resources.

Keywords: Customer operant resource, Value co-creation, Waste management, Web-based platform, Hierarchical regression

1. Introduction

In recent times, internet-based platforms have become sources of rich knowledge and skills from consumers, and for that reason firms are tapping into these resources to create value for the market. Thus, customer online value co-creation is one strategy organizations are using to create value and to brand, particularly, in the area of product advocacy.

Waste management has engaged the attention of governments, policy makers, and academics much more recently as it has ramifications for the health and well-being of citizens and the environment, and subsequently on the economy. In this regard, waste management firms and policy makers should view waste management efforts as a strategic decision and not as a tactical decision (Esmailian et al., 2018). Therefore, the strategic planning for waste management must focus on increasing productivity through empowering relations among various stakeholders (Esmailian et al., 2018; Fuldauer et al., 2019). According to literature, this approach improves waste management efficiency and lower cost of operation (Lu and Sidortsov, 2019).

Africa is experiencing rapid urbanization, with high urban population growth rates. However, poor urban planning has led to emergence of slums in urban centers. This has resulted in poor sanitation with health consequences. High volumes of waste are generated on daily basis, yet a little over 30 percent of households in urban centers have their refuse collected by waste firms (Ghana Statistical Service, 2014). Albeit public-private partnership (PPP) has been introduced in waste management in Ghana, customers of the waste collection firms are often not happy with the market offerings of the waste firms. Since adoption of social media for customer engagement can lead to better value creation, waste management firms can improve their brand building efforts through customer value co-creation. Since waste management has implications for public

health, a strategy that would get the masses to be involved in its provision and to change negative attitude towards its management would certainly be effective.

Co-creation, a strategy whereby enterprises and their stakeholders, especially customers, come together to mutually produce value, have gained currency since the early 2000s. The concept is premised on the exchange of resources (knowledge and skills) in the provision of services that are beneficial to both parties (Vargo and Lusch, 2004). Therefore, marketing managers have realized the importance of utilizing the intangible resources of customers to co-create value and to whip up product advocacy by customers in a digitalized world.

The Service-dominant logic (S-D Logic) concept underpinning value co-creation is premised on the key assumption that firms now do not operate closed systems, where value creation is limited to the confines of the firm. Rather, their boundaries have become blurred (Vargo and Lusch, 2004). Accordingly, firm value creation must incorporate both its resources (tangible and intangible) with those of customers' intangibles resources of knowledge and skills developed from interactions with brands online. Thus, to stay connected and bonded to customers, firms need to embrace the essential intangible resources of customers in the form of their acquired previous experiences, knowledge and skills to co-create their values. The expected outcomes of this co-creative process are numerous, including brand loyalty, customer satisfaction, trust, empowerment, emotional bonding and positive word-of-mouth. However, there are questions regarding online co-creation process that have not been adequately addressed by literature, and which need to be answered. Key among the questions are:

- What specific resources are customers expected to bring on board to the co-creation process to create the expected value?

- How do firms' digital platforms influence the relationship between customer operant resources and online co-creation?

With regard to the specific customer operant resources for online value co-creation, academic researches show that customer knowledge and skills are key resources when it comes to online brand-customer value co-creation (Vargo and Lusch, 2004; Prahalad and Ramaswamy, 2004; Ramaswamy, 2009). Thus, in recent times, operationalization of customer operant resources has begun to receive attention in research. For instance, Alves et al. (2016) identified customer expertise as one of the antecedent of customer-firm value co-creation in the hairdresser/barber service and mobile and Internet telecommunications services, and quantitatively measured its impact on value co-creation. While they recognized the composition of customer expertise as comprising factors such as specialized knowledge, skills and energy, they bulked these factors together and measured it as one. The present study is of the view that each component of customer expertise must be assessed individually to determine whether or not they impact value co-creation significantly. This is because they are not derived from the same source or situation. They evolve from physical, cultural, social and relational dimensions (Tregua et al., 2015). This view is supported by Baron and Warnaby (2011) who concluded in their study that “a focus on individual customer resources can provide insights into how to manage co-creation of value”.

Another noted gap in literature is the fact that previous studies on co-creation in the waste and environment sectors have largely been broad in perspective (e.g., Kruger et al., 2018). Limiting the study to specific contexts will give a better picture of such specific sectors. This study has, thus, seeks to limit the scope to the dyadic perspective of waste collection service firms – customers value co-creation. This ensures that specific managerial and theoretical implications are proposed for effective implementation, and to engender further academic studies

that would enhance co-creation literature in this specific context.

Connected to the previous point is the fact that empirical studies on co-creation and its impact on branding outcomes had concentrated on relatively popular sectors such as banking (Cambra-Fierro et al., 2017), health (McColl-Kennedy et al., 2017), tourism and hospitality and education (Kamboj and Rahman, 2016; Chen and Wang, 2016; Ismail, 2017), sports (Yoshida et al., 2018) and many others. There is the need to replicate value co-creation studies in other sectors or industries (Cambra-Fierro et al., 2017), especially sectors this study considers as gray areas such as sanitation and SWM. Therefore, this study looks at online value co-creation from the perspective of customers (households) of private waste collection firms, as there is limited studies of value co-creation concept in the waste collection sector or context in academic literature.

Additionally, though digital platform is an object rather than a latent variable, the moderating role of the digital platform being used in the co-creative venture has not received much attention in academic research, albeit it is recognized as the main engagement platform for digitalized co-creation activities (Ramaswamy and Ozcan, 2016). This study looks at the moderating effect of the firm's web-based platforms on the relationship between customer operant resources and online value co-creation.

The main objective of the study is, therefore, to assess the relationship among customer operant resources, online value co-creation and digital branding through electronic word-of-mouth. To achieve this objective, the paper is structured as follows: Section 2 details the literature review of the study, and section 3 constitutes the conceptual framework and the development of hypotheses. Section 4 discusses the methodology employed to gather and analyze the data for the study. Section 5 presents the result of the analyzes, while section 6

presents the discussion, theoretical and managerial implications, and limitation of the study. Section 7 is the conclusion drawn from the study.

2. Literature review

Over the last decade, the concept of value co-creation has been subject of intense study by scholars across many disciplines. Many scholars from diverse disciplines and practitioners have taken keen interest in the subject. Co-creation has been defined as the “interaction of individuals within a framework to evolve, re-define or invent something that is new” (Ind et al., 2012), p. 7. It has been researched in various disciplines (marketing, psychology, philosophy and others) and contexts such as health (Oerle et al., 2016; McColl-Kennedy et al., 2017), fashion (Frasquet-Deltoro et al., 2019), hairdresser/ barber services (Alves et al., 2016), banking (Mainardes et al., 2017), library service (Baron and Warnaby, 2011), hospitality (Zhang et al., 2015; Tu et al., 2018), education (Verleye, 2015), public services and many other sectors. It is regarded as an open, participatory and collaborative innovation system, incorporating resources from different actors in a network fashion, particularly through digital platforms (Akman et al., 2018). Following the trails of studies into the concept, it can be deduced that value co-creation has come to challenge various traditional modes of content and information sharing, firm-customer interactions and brand building strategies. Though it comes with new opportunities, it also comes with challenges for firms adopting the concept. In this regard, new paradigms of marketing orientation and philosophies have emerged to guide co-creation and marketing activities. Presently, enterprises need to often set and adopt new (and often ad hoc) business models to be able to deal with challenges brought about by changes in the business landscape, as well as to take advantage of the opportunities they (the challenges) present.

Historically, the concept of resources had been restricted to natural and economic resources such as land, animal life, plants life, minerals and other natural resources (Vargo and Lusch, 2004). However, over the last six decades, the definition of resources has been expanded to include the intangible resources of all stakeholders. Natural resources constituted operand resources, which were acted on to produce goods to satisfy consumers. This is contrasted with operant resources such as human knowledge and skills, which are used to act on operand resources. Thus, through operant resources, value is added to operand resources to produce effect through deeds, processes, and performances provided, coproduced, or co-created by one entity or person for and/or with another entity or person (Vargo and Lusch, 2004). In a nutshell, value creation requires both operand and operant resources to interact to achieve effect. Secondly, value creation requires human knowledge and skills, in addition to economic resources such as machines, to achieve effect.

From literature, value co-creation is volitional and thus demands the commitment and resources of actors. The need for customer and firm commitment to value co-creation is supported by various theories. For instance, the theory of planned behavior (Ajzen, 1985) shows that intentions are influenced by both internal (personal) and external (social) factors. The personal factor deals with the attitude (based of his/her evaluation) of the individual towards performing the behavior, while the social factor or determinant involves the perception of the societal pressures put on the individual to either perform or not perform a behavior in question (subjective norm). Put together, an intention to perform an action is determined by the positive evaluation of the behavior or action by the individual and his/her perception of what important others think of him/her. Therefore, “a person who believes that performing a given behavior will lead to mostly positive outcomes will hold a favorable attitude toward performing the behavior

while a person who believes that performing the behavior will lead to mostly negative outcomes will hold an unfavorable attitude”(Ajzen, 1985), pp. 13-14.

With regard to resources, the service-dominant logic is premised on the primacy of knowledge and skills of actors as necessary resources for an effective and efficient value co-creation to achieve competitive edge. In the same regard, the resources-advantage theory (Hunt, 2015) also emphasizes the ability for a firm to achieve sustainable competitive advantage through its ability to obtain superior resources, capabilities or basic competences (Urbano et al., 2013). As a combiner of resources, therefore, the firm integrates resources within and resources without including customer expertise such as knowledge and skills. It stands to reason that the magnitude of skills, abilities, will power or opportunities customers have, as well as social interaction and pressure, will affect their intentions to participate in co-creation activities. Eventually, organizations intending to enter into value co-creation with customers will need to take actions to positively enhance the intentions of customers to participate in the process.

Many reasons have been put forth for the adoption of value co-creation by enterprises. Proponents of customer value co-creation such as Vargo and Lusch (2004) and Ramaswamy (2009) are also of the view that given the ever increasing servicization of products, enterprises alone cannot offer value propositions. Servicization is defined as “a business strategy to sell the functionality of a product rather than the product itself” (Örsdemir et al., 2018), p. 1. In this sense, the expertise of the consumer is needed to ensure mutual satisfaction. The degree of servicization, however, depends on the nature of product on offer, and therefore, the issue of servicization as a basis for value co-creation may not hold for every business.

Another argument in favor of value co-creation is the rapid digitization of human relationships, giving rise to the growth of online brand communities, which in turn are shaping

consumer-to-consumer interactions and their behavior (Örsdemir et al., 2018). In online communities, information is provided by the members, knowledge is created, and consumers are connected with common interest (Oerle et al., 2016). These researchers are of the opinion that brand-consumer relationship is strengthened by consumers' participation in communities. Consequently, in order to create better value for the customer, brand strategists are encouraged to actively involve members of online communities to create better values, and to stay competitive.

Many recent stream of research have highlighted many more motivations for value co-creation, to both firms and customers, and for which reasons, enterprises need to embrace it. On the part of firms, these studies suggest that value co-creation contributes to better customer relations and customer satisfaction (Frasquet-Deltoro et al., 2019). According to Kennedy and Guzman (2016), value co-creation achieves two main goals: organizational goals and brand goals. For organizational goals, it leads to increased return on investment, it improves customer insights, it allows access to additional intellectual resources, it fulfils organizational mission statement (especially when the mission of the firm is to work closely with customers) and it improves service quality. With regard to brand goals, it leads to strong brand, heightened brand loyalty, greater brand awareness, improved differentiation and enhanced brand experience. It further leads to increased willingness to pay by customers (Tu et al., 2018), and stimulates consumer-brand experience through community-brand interactions (Rialti et al., 2018). On the side of customers, value co-creation sharpens their competences and provides the platform to demonstrate their knowledge and skills in the form of idea generation and concept design, provides a sense of belongingness and bonding as they get to connect with other actors, and a sense of satisfaction (Kennedy and Guzmán, 2016). Despite these numerous benefits of value co-creation, some organizations are pessimistic of its adoption. Their fear is borne out of lack of

trust in the expertise of customers (and to some extent employees) to make meaningful contributions to value design and creation (Ind et al., 2012).

To deal with the challenges of value co-creation, some recent scholars have suggested some strategies, including the following: Firms should realize that they exist in an open, participatory ecosystem. Therefore, ‘they should embrace value co-creation by being in charge of the co-creative process, providing the right co-creative factors, and shaping the intentions and behaviors of customers and employees through education and training’ (Alves et al., 2016).

In a nutshell, “co-creation has emerged due to the coincidence of several developments: the mainstream adoption of internet technologies, the orientation towards services and experiences, a more open approach to innovation and the growth of social, collaboration and customization technologies” (Ind and Coates, 2013), p. 91.

3. Conceptual Framework and Hypotheses Development

3.1 Operant resources

Hunt (2015) (p. 361) defined resources as “the tangible and intangible entities available to the firm that enable it to produce efficiently and/or effectively a market offering that has value for some marketing segment(s).” Drawing from the resource-advantage theory and other literature on resources, Madhavaram and Hunt (2008) identified seven categories of basic resources of the firm which can be either operand or operant – financial, physical, legal, human, organizational, informational, and relational.

However, current academic literature shows that for firms to efficiently and effectively create value that satisfies consumers, they cannot depend solely on their internal resources. They also need resources from their stakeholders outside the boundaries of the firm, especially consumers. According to Madhavaram and Hunt (2008), marketing’s evolution towards service-dominant

logic demands that the focus of marketing should be on the intangible, dynamic, operant resources of consumers which are critical to a firm's competitive advantage.

Just as organizations have both operand and operant resources, customers also possess operand resources and operant resources (Arnould et al., 2006; Baron and Warnaby, 2011). Operant resources are defined as the individually possessed resources which are generally invisible and intangible, and "shaped out of knowledge and capacities," while operand resources represent tangible assets such as economic resources over which customers act on to create value (Alves et al., 2016) (p. 71). Therefore, operant resources of a customer are personally related and reflect individual capacities along socially interactive abilities.

According to Arnould et al. (2006) and other later studies by Baron and Warnaby and Alves et al., customer operant resources can be classified as physical, social or cultural. Physical resources are defined in terms of energy, emotions and strength. Cultural operant resources include specialized knowledge and skills, life expectancy and historical imagination. Social resources are made up of both personal and cultural relationships such as family relationships, consumer communities and commercial relationships. It is these resources which are pooled together and deployed by individual consumers and combined with firm resources to efficiently and effectively create value.

The discussion up to this point has shown that customer operant resources of knowledge (experience of virtual value creation) and skills (technological ability) are very critical with regard to online engagement for co-creation. In addition to these, customers' knowledge about the product or service context (subject-specific knowledge) is also important for customers to make meaningful contributions during value co-creation. Customers have been classified as the most valuable assets of firms (Lusch and Vargo, 2009). In this regard, customer resources such

as knowledge and skills are the most valuable resources firms can have. Knowledge as resource, for instance, enable customers to be better positioned to engage in value co-creation. Kenny and Fahy (2011) opined that knowledge, skills and “life” experiences, which they put together as human capital, are accumulated through education and experiences. It is, therefore, important to understand how and in what ways individual customer operant resources of knowledge, skills and willingness actually influence customers’ value co-creation activities (Alves et al., 2016). The debate on the impact of these specific customer operant resources on customer online value co-creation has, however, received limited quantitative attention.

3.1.1 Customer Knowledge

Knowledge means “understanding” and skill means “knowing how to make something happen (Senker, 1995). Web-based customer knowledge is an important organizational asset (He et al., 2018). Knowledge, which constitutes an intangible resource to the firm, influences customers’ or actors’ motivation to participate in collaborative ventures, as it is the resource that is shared during value creation (Hirscher et al., 2018). Value is regarded as an experience, and therefore, past experience/knowledge is relevant and forms the basis for effective customer engagement and co-creation (Pasternak et al., 2017). According to Kumar et al. (2018), customer knowledge is the customer’s total experience or knowledge with a firm’s offering through both direct and indirect encounters. Therefore, customer knowledge in this study refers to knowledge that resides in customers which are resources for value creation (Lee et al., 2006). This is opposed to knowledge for customers (sent from an organization to its customers about the firm’s products) (He et al., 2018) and knowledge about customers (eg., demographics and lifestyle of customers) (He et al., 2018; Lee et al., 2006). When there is high knowledge self-efficacy by customers, they are willing to share their knowledge with enterprises and others and to promote

their preferred brands, especially through web-based platforms. The opposite of this statement also holds true (Lee et al., 2006). It is, therefore, hypothesized that:

H1. Customer knowledge has a positive significant effect on online co-creation.

H2. Customer knowledge has a positive significant effect on electronic word-of-mouth (e-WOM).

3.1.2 Customer Skills

Digital competence or skill is defined by Ferrari (2012) as “the set of knowledge, skills, attitudes (including abilities, strategies, values and awareness) that are required when using information and communication technology (ICT) and digital media to perform tasks; solve problems; communicate; manage information; collaborate; create and share content; and build knowledge effectively, efficiently, appropriately, critically, creatively, autonomously, flexibly, ethically, reflectively for work, leisure, participation, learning, socializing, consuming, and empowerment”, p. 43. Digital competence is, thus, made up of information management, collaboration, communication and sharing, creation of content and knowledge, ethics and responsibility, evaluation and problem-solving, and technical operations. This position is reaffirmed by Ukwoma et al. (2016) who posit that digital competence/ability enables consumers to use digital tools to enrich their learning and experiences, and be better placed to find, evaluate, solve and communicate digital information through online platforms.

Therefore, customer skills is the ability or attributes that the customer possesses and which enables him/her to fully execute a task relating to a particular service process (Kumar et al., 2018). Customers’ capacity to perform value co-creation activities are influenced by personal factors such as the ability or skills/proficiency of customers. Akman et al. (2018) argue that customer ability/skills predict co-creation activities such as information sharing and providing

feedback. Therefore, customer ability or proficiency to use technological interfaces such as mobile technology is a key driver for online customer co-creation.

Customers' digital capabilities is positively enhanced through frequent engagements and which improves brand identity (Foroudi et al., 2017). Thus, customers who have developed online experiences, and have acquired knowledge, can initiate value co-creation with both the firm and other customers in order to bring about the desired firm-desired and customer-desired outcomes. With better technological skills, customers will be better placed to do effective online advocacy functions. Flowing from these, lack of technological infrastructure, low internet connectivity, lack of power/electricity and weak (ICT) education can be an inhibition to customer digital competence development. This leads to the following hypotheses:

H3. Customer digital skills positively impact online co-creation.

H4. Customer digital skills positively impact e-WOM.

3.1.3 Customer Willingness to Co-create

One key factor for successful co-creation is willingness. The theory of planned behavior emphasized the importance of customer willingness when it comes to knowledge sharing (Ajzen, 1985). Customer willingness constitute an important operant resource to enable firm-customer value co-creation to take place. Therefore, consumer-service provider co-creation ventures hinges greatly on consumers' willingness to co-create. From the theory of planned behavior, knowledge and skills influence the willingness to take an action (participation in value co-creation). Customers' willingness to co-create, however, depends on the underlying motives consumers seek to achieve from co-creation (Nghina et al., 2017). On the individual side, willingness to co-create is also influenced by the education level of the end-users, family structure and personal characteristics while on the organizational side, communication

infrastructure, attitude of managers to involve end-users and the level of risk-averse culture within the organization have impact on firms' willingness to engage in co-creation with customers (Voorberg et al., 2017). Co-creation success is thus dependent on the knowledge, ability and willingness of co-creators and the enterprise's motivation and technological infrastructure to set up and effectively management a digital engagement platform. It is, therefore, proposed that:

H5. Online customer co-creation is positively impacted by customer willingness to co-create.

H6. Customer willingness to co-create has significant positive effect on online advocacy (e-WOM).

3.2 *Value Co-creation*

Value is a benefit and thus represents an increase in the well-being of either users or organizations (Ketonen-oksi et al., 2016; Lusch and Vargo, 2014). According to the fundamental premise (FP) 10 of the S-D logic model by Vargo and Lusch, value is always uniquely and phenomenologically determined by the beneficiary. This implies that value creation is not tied to the service of a single actor or to a particular resource, but rather co-created by the integration of resources, knowledge, and (cap-)abilities of enterprises and their stakeholders (Arnold, 2017). It stands to reason that beneficiaries of firms' outputs should be privy to information regarding the firms' activities as well as the opportunity to actively participate in decision-making (Guimaraes et al., 2018). Therefore, "value cannot be provided by one actor to another; rather, it can only be proposed. Thus, customer value is a dual concept" (Kumar and Reinartz, 2016). The implication is that value co-creation is a venture between service systems of customers and organizations who are connected by value propositions so that they (customers and organizations) derive value (that is, value-in-use) through the integration of resources from

their respective service systems (Ketonen-oksi et al., 2016). Therefore, the difference between value creation and value co-creation is that value creation benefits one actor while in value co-creation there is interdependencies of actors to create value that is beneficial to all. In line with fundamental premise 6 of the S-D logic which says that the customer is always a co-creator of value, the knowledge and perceptions of the customer are thus essential to value.

From the various definitions, it is clear that co-creation is a joint venture in value creation between an enterprise and its key stakeholders. It results in sharing of knowledge and experiences and learning from each other, and it fosters stronger relationship among stakeholders (Arnold, 2017). In the Service-dominant logic and the resource-advantage theories, the firm seeks to use knowledge as a competitive advantage tool to its benefit. Therefore, tapping wisdom from a broad spectrum of actors will be to the benefit of the firm.

Engagement is a key emerging theme in value co-creation and constitutes one of the core mechanisms underpinning co-creation (Tregua et al., 2015). Mollen and Wilson (2010) defined consumer online engagement as “the cognitive and affective commitment to an active relationship with the brand as personified by the website or other computer-mediated entities designed to communicate brand value”, p. 923. In effect, online engagement requires the knowledge and affection of the customer. Linking this to customer online value co-creation, it implies that customer engagement for value creation demands that the customer be experienced and knowledgeable about the co-creation venture for it to be effective. Again, the customer needs to be skillful with regard to the use of websites or digital platforms. As customer co-creation requires the deployment of customer resources into the co-creative process to combine with firm resources to create value, it presupposes that both engagement and customer co-creation require the cognitive abilities and willingness in order to achieve the value co-creation objective.

Customer value co-creation behaviors in the context of services are often demonstrated in behaviors such as information seeking, information sharing, responsible behavior and personal interaction, rapport building, helping and development (Payne et al., 2008; Yi and Gong, 2013; France et al., 2018; Waseem et al., 2018). With regard to co-creation within online brand communities, other activities such as creating ideas for new product design, selecting product designs, voting on products to be ultimately marketed, and giving titles or descriptions to products are also performed by customers (Fuchs and Schreier, 2011; Akman et al., 2018). Relating these to the theory of planned behavior, it can be inferred that customers' intention or determination to participate in a co-creation activity could be to undertake one or more of the aforementioned actions or behaviors such as advocacy to enhance competence and to achieve a need.

Co-creation is, therefore, found to mediate between customer operant resources and customer advocacy (Sarmah et al., 2018). Thus, pertinent literature on co-creation confirms that value co-creation with active participants has positive effect on branding (Kristal et al., 2016), and by extension brand advocacy. It is, therefore, hypothesized that:

H7. Online value co-creation with customers has significant positive effect on online e-WOM.

H8. Online value co-creation has a mediating effect on the relationship between customer knowledge and e-WOM.

H9. Online value co-creation has a mediating effect on the relationship between customer skills and e-WOM.

H10. Online value c-creation has a mediating effect on the relationship between customer willingness to co-create and e-WOM.

3.3 Web-based Platforms

Technology is regarded as a key operant resource necessary for value co-creation, service innovation and systems (re)formation (Akaka and Vargo, 2014) and it has a great impact on marketing (Foroudi et al., 2017). The nature of firms' brand engagement platforms are essential components for efficient customer online value co-creation. Authors like Baron and Warnaby have highlighted the importance of engagement platforms to online value co-creation. However, literature on empirical test of engagement platform's influence on the relationship between customer operant resources and online value co-creation is limited (Pasternak et al., 2017).

The internet has been particularly found to be a very useful platform for effective customer co-creation (Roberts and Hughes, 2014) as it enables faster and efficient sharing of information (Maglio and Spohrer, 2008) regarding the "what" and "how" of the co-creation venture. Again, opportunities provided by the service provider's digital platforms provide online community members the chance to involve in co-creation activities (Akman et al., 2018). Since new technologies facilitates communication among co-creators, López et al. (2017) suggest that firms should provide consumers with these platforms through which they (customers) could disseminate their co-creation experiences and emotions. Therefore, the effectiveness of online value co-creation is very much dependent on the digital platform for the actors to engage (Frow et al., 2015). Thus, it is hypothesized that:

H11. The relationship between customer knowledge and online co-creation is positively moderated by web-based platforms.

H12. The effect of customer skills on online co-creation is positively moderated by the firm's web-based platforms.

H13. The effect of customer willingness and online co-creation is positively moderated by the firm's web-based platforms.

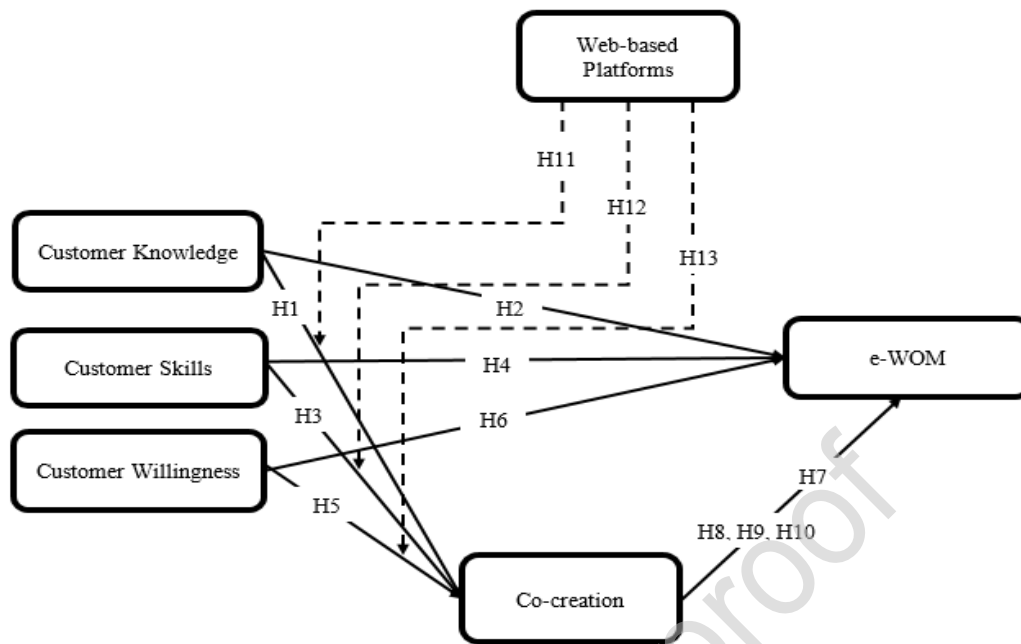


Fig. 1. Conceptual Model

4. Methodology

4.1 Data Collection

The study adopted the positivist methodological paradigm which guided the formulation of the research questions, hypotheses and testing of data. In this study, quantitative approach was used in order to test hypotheses formulated out of the existing theories to support or otherwise the hypotheses. More especially, the quantitative approach helped to determine the effects of the independent variables (customer knowledge, customer skills, and customer willingness) on the dependent variables (e-WOM), through a mediating variable (co-creation).

The cross-sectional field survey design was adopted, using structured, closed-ended survey questionnaires. Data was collected through online platforms through non-probabilistic techniques of convenience and snowballing sampling. The questionnaire was posted on personal Facebook page and other social media platforms the researchers belong to. Friends were then asked to post it on platforms they also belong to. Adequate clarification was provided to make the answering

of the questionnaire easier. Two key instructions were set to determine eligible respondents. One, the respondent should have been using social media for social and business interactions. This was purposely used to be able to meet the objectives of the study. The second criterion was that the respondent must be serviced by a private waste firm. This was also important as the study seeks to establish customer/household relationship with solid waste collection firms. The constructs were measured using the Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). A total of 607 were obtained out of which 583 responses were used for the final analysis. After screening, twenty-four (24) questionnaires were detected to be unengaged, and their use could affect the validity of the results. Thus, they were excluded from the final analysis.

4.2 Construct Measurement

The items used to measure the constructs in this study were derived from various sources. Some previously tested scales were adapted to suit the present study and to improve content validity, while others were developed by the authors. The items in the measurement scales for customer knowledge and web-based platforms were adapted from Yip (2011) and Wang and Tang (2001) respectively. The scale for customer skills was designed with insights from Kaplan and Haenlein (2014), while that of customer willingness was designed using modified items from Nghina (2017). Scales for co-creation and e-WOM were designed by the authors vis-à-vis extant literature on the constructs.

4.3 Data Analysis

Data obtained from the responses to the filled questionnaires were first coded and entered into the Statistical Package for Social Science (SPSS) version 22 for statistical analysis. Statistical outputs such as frequencies, correlations and validity measures were generated for the various

variables used for the study. The key statistical technique used to analyze the relationships/interdependence of the independent and the dependent variables and to test the hypotheses was hierarchical regression. Process was further employed to confirm or otherwise the mediation results from the regression test.

5. Results

5.1 Sample Profile

Table 1 details the demographic characteristics of the study sample. Of the total of 583 respondents used for the study, 73.6% (429) were males while 26.4% (154) were female. In terms of age, 67.7% were below age 40. 21.1% were within the 40-49 years' age bracket while the remaining 11.1% were above the age 50. The educational background of the respondents ranges from basic education to graduate level education. Majority of the respondents (80.1%) had post senior high school educational qualification. 0.7% had basic education, 2.4% had junior high/middle school education and 16.8% had senior high education. With regard to housing of the respondents, 36.4% are living in their own apartments and 52.1% constitute the proportion who were living in rented apartments. Those living in government housing units, barracks and others constituted 13.2%.

Table 1
Demographic Characteristics of Respondents

Characteristic	Items	Frequency	Percentage
Gender	Male	429	73.6
	Female	154	26.4
Age	20 - 29	164	28.1
	30 - 39	231	39.6
	40 - 49	123	21.1
	50 - 59	52	8.9
	60 - 69	13	2.2
	Above 69	0	0.0
	Basic Education	4	0.7
Education	Junior High/Middle School	14	2.4
	Senior High	98	16.8
	Bachelor/HND/Teachers'	353	60.5
	Diploma		
	Master/PhD	114	19.6
Housing	Own Apartment	202	34.6
	Rented Apartment	304	52.1
	Government Housing	34	5.8
	Military/Police/Prisons	12	2.1
	Barracks		
	Other	31	5.3

5.2 Construct Reliability, Validity, Descriptive Statistics and Correlation

The normality of the data was measured using the skewness. All the variables were within the acceptable threshold of ± 2.58 or ± 1.96 as suggested by Hair et al. (2014). The reliability of the model was assessed using the Cronbach's alpha. From Table 2, all the Cronbach's alphas are within acceptable ranges: customer knowledge (0.934), customer skills (0.719), willingness (0.778), co-creation (0.902), e-WOM (0.793) and web-based platforms (0.877.) This clearly demonstrates high internal reliability of the measurement. Thus, the requirement for exploratory factor analysis in this study is satisfied.

An exploratory factor analysis (EFA) was conducted to find out which items pooled together to measure the same item. The estimation technique used was the principal component extraction with promax rotation method. At the end of the EFA, items found to be problematic and also

affect validity, and those with factor loading below 0.5 were removed, in accordance with literature (Malhotra et al., 2017).

All the average variance extracted (AVE) values achieved the minimum threshold of 0.5 (see Table 2), demonstrating high convergent validity (meaning items load well on the constructs). The AVEs are customer knowledge (0.717), customer skills (0.584), willingness (0.667), co-creation (0.674), e-WOM (0.614) and web-based platforms (0.619). Composite reliability (CR) measures were all above the minimum threshold of 0.7. The composite reliabilities for the variables are customer knowledge (0.947), customer skills (0.805), willingness (0.856) co-creation (0.925), e-WOM (0.864) and web-based platforms (0.907). This clearly demonstrates that discriminant validity was achieved (constructs are measuring different things). The square roots of AVEs as shown in Table 3 are all above 0.5, and higher than the correlation coefficients for each construct.

Table 2
Construct Reliability and Validity

Construct	Cronbach alpha	Skewness	Kurtosis	AVE	CR
1. Customer knowledge	.934	-.707	-.124	.717	.947
2. Customer skills	.719	-.629	.537	.584	.805
3. Customer willingness	.778	-1.208	2.365	.667	.856
4. Co-creation	.902	-.081	-.785	.674	.925
5. E-Word of Mouth	.793	-.444	.895	.614	.864
6. Web-based platforms	.877	-.402	.697	.619	.907

Pearson correlation was used to explore the relationship among the variables. From Table 3, there was a strong, positive correlation between co-creation and web-based or digital platforms ($r = 0.489$, $p < 0.01$), between customer skills and willingness ($r = 0.482$, $p < .01$), between willingness and e-WOM ($r = 0.331$, $p < 0.01$), between customer knowledge and e-WOM ($r = 0.305$, $p < 0.01$) and between customer skills and e-WOM ($r = 0.288$, $p < 0.01$). In a nutshell, the measurement model demonstrates high internal reliability and validity.

Table 3
Descriptive Statistics and Correlation

Construct	Mean	SD	1	2	3	4	5	6	7	8	9
1. Customer knowledge	3.377	.962	(.847)								
2. Customer skills	3.886	.733	.102*	(.764)							
3. Customer willingness	4.090	.756	.140**	.482**	(.817)						
4. Co-creation	2.631	.944	.212**	.031	.030	(.821)					
5. E-Word of Mouth	3.972	.597	.305**	.288**	.331**	.122**	(.784)				
6. Web-based platforms	3.101	.770	.184**	.026	-.004	.489**	.153**	(.787)			
7. Gender	1.26	.441	-.044	-.213**	-.067	.132**	-.105*	.036	1		
8. Age	2.170	1.010	-.002	-.033	-.055	.044	-.083	-.112**	.089*	1	
9. Education	3.960	.722	-.037	.302**	.229**	-.197**	-.003	-.160**	-.246**	.090	1

Note. Figures in parentheses are square roots of AVEs

5.3 Hypotheses Test Results

Hypotheses were tested using hierarchical regression. The variance inflation factor (VIF) method was first used to assess multicollinearity. All the regression equations had VIFs less than 2, indicating nonexistence of multicollinearity among the constructs (Hair et al., 2010). The model also explained 69% of total variance explained and this a good indication of model fit. The hierarchical regression results are shown in Table 4.

From Table 4, the results showed significant relationships among customer operant resources, online value co-creation and e-WOM. All direct relationships were significant, with the strongest being customer operant resources and e-WOM relationships: customer willingness → e-WOM (M14: $t = 8.628^{***}$, $\beta = 0.345$), customer skills → e-WOM (M13: $t = 7.257^{***}$, $\beta = 0.304$), and customer knowledge → e-WOM (M12: $t = 7.640^{***}$, $\beta = 0.301$). The remaining direct relationships are customer knowledge and co-creation (M2: $t = 5.289^{***}$, $\beta = 0.210$), co-creation and e-WOM (M15: $t = 3.380^{**}$, $\beta = 0.142$), customer skills and co-creation (M3: $t = 2.766^{**}$, $\beta = 0.118$) and customer willingness and co-creation (M4: $t = 2.037^{***}$, $\beta = 0.085$). These indicate that hypotheses 1 to 7 have been confirmed, and that there are significant positive relationships among customer operant resources, value co-creation and online customer advocacy (e-WOM).

The mediating role of co-creation between customer operant resources and e-WOM were found to be significant for the relationships between customer willingness and e-WOM (M18: $t = 2.856^{**}$, $\beta = 0.113$), and between customer skills and e-WOM (M17: $t = 2.699^{**}$, $\beta = 0.109$). Co-creation did not have significant mediating effect on customer knowledge – e-WOM relationship (M16: $t = 1.920$, $\beta = 0.079$). Thus, whereas hypothesis 8 was not supported, hypotheses 9 and 10 were supported. This means that value co-creation with customers positively mediates between customer operant resources of skills and willingness and online word of mouth communication.

Moderation effect of web-based platforms on co-creation was also tested through the hierarchical regression methodology. For moderation, the variables were mean-centered before the test as suggested by literature (Dawson, 2014). The moderation test results demonstrated significant positive moderating effect of firms' web-based platforms on the relationship between customer operant resources and online value co-creation. Hypothesis 11 posits that web-based platforms moderates the effect of customer knowledge on online co-creation. From Model 8 in Table 4, the regression weight of the interaction effect of web-based platforms on customer knowledge - co-creation relationship is significant ($t = 1.992^*$, $\beta = 0.073$, $p < 0.05$). Hypothesis 11 is thus confirmed. Hypothesis 12 states that web-based platforms moderate the relationship between customer skills and online co-creation. According to Table 4, Model 9, the moderation effect is statistically significant ($t = 3.585^{***}$, $\beta = 0.136$, $p < 0.001$). Hypothesis 13 (Model 10, Table 4) also shows web-based platforms moderates the effect of customer willingness on e-WOM ($t = 3.805^{***}$, $\beta = 0.137$, $p < 0.001$).

The pictorial depiction of the interaction effects of web-based platforms are presented in Fig. 2-4. The figures demonstrate that the relationships between customer operant resources of

knowledge, skills and willingness and co-creation are positive for firms with better developed web-based platforms (orange lines). However, the relationships between the operant resources and co-creation is negative for firms with less developed web-based platforms (blue lines). In other words, higher and better firm web-based platforms positively adjust the relationships between customer operant resources of customer knowledge, customer skills and customer willingness and online co-creation. On the other hand, low web-based platforms negatively adjust the relationship between the operant resources and co-creation.

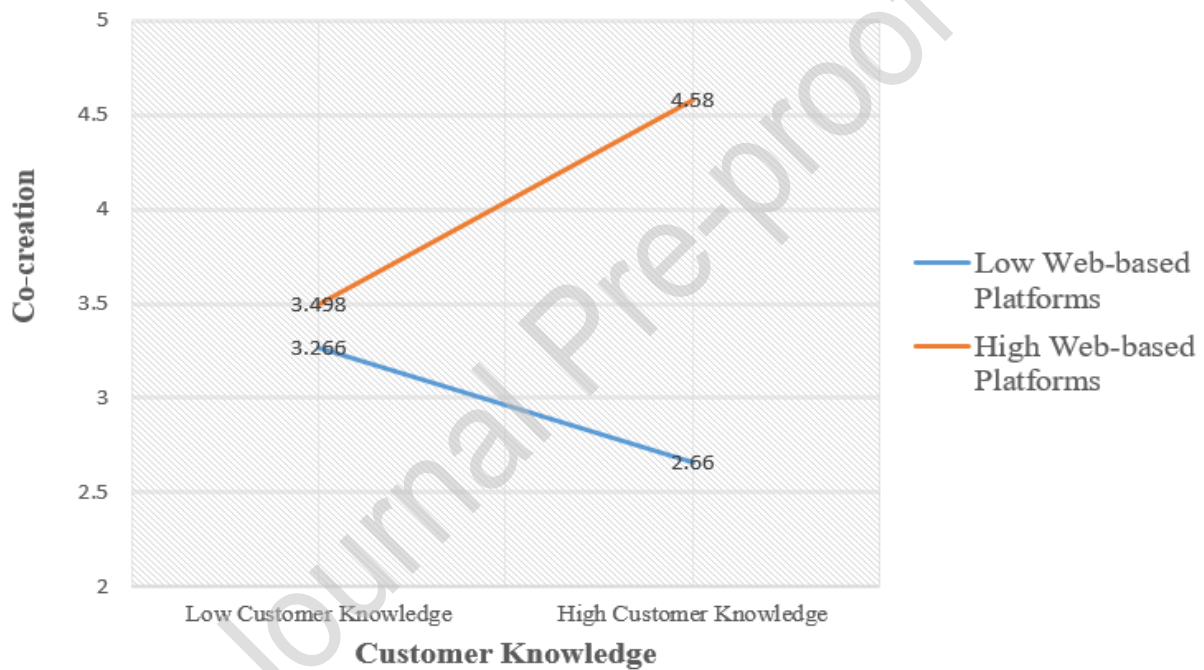


Fig. 2. Customer knowledge and co-creation: Moderating effect of web-based platforms.

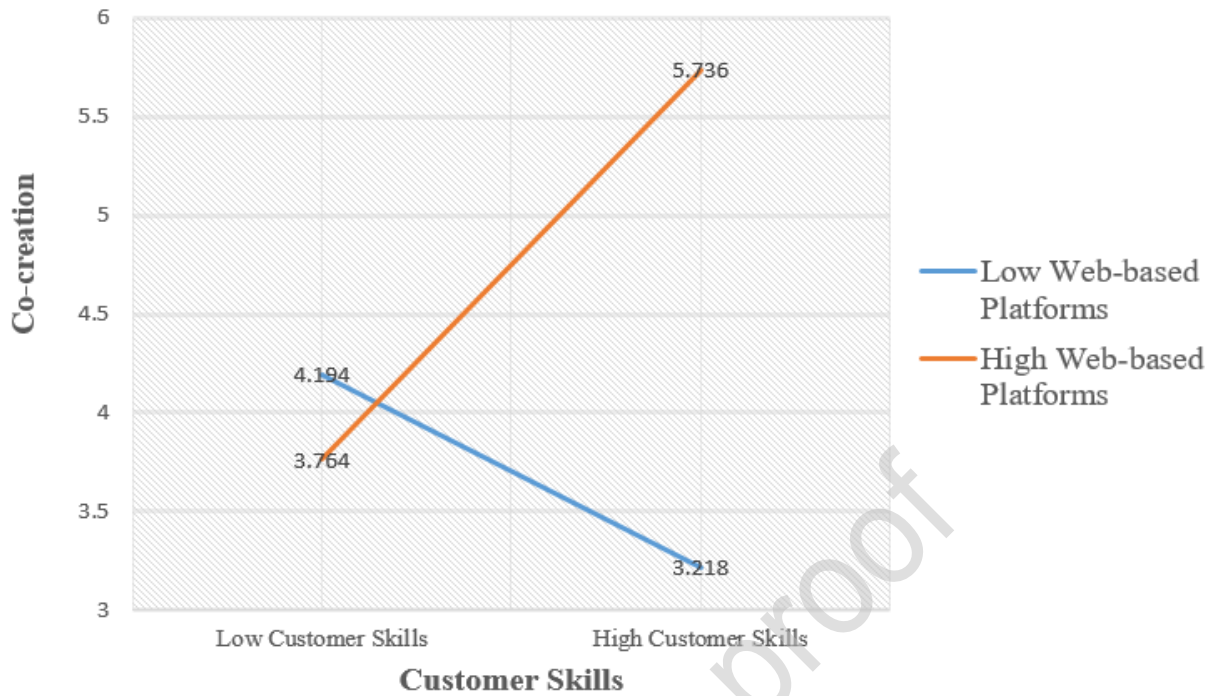


Fig. 3. Customer skills and co-creation: Moderating effect of web-based platforms.

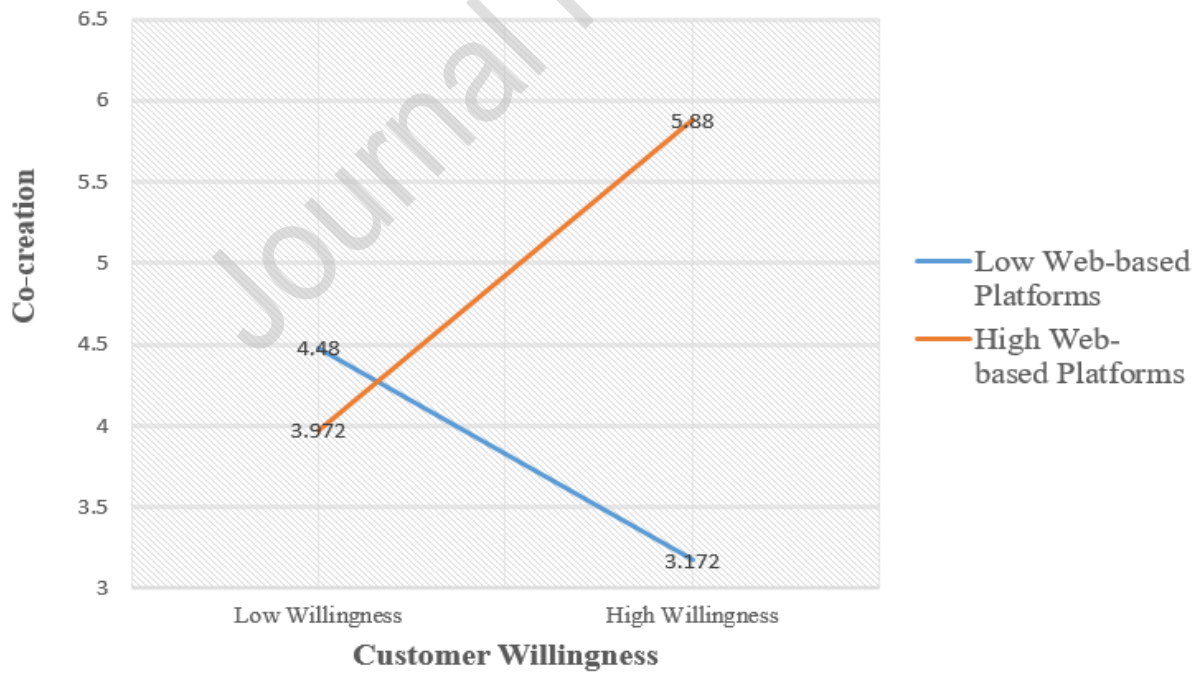


Fig. 4. Customer willingness and co-creation: Moderating effect of web-based platforms.

Table 4
Results of hierarchical regression analysis

Variables		Dependent Variable: Co-creation (M1 → M10)									
		M1	M2	M3	M4	M5	M6	M7	M8	M9	M10
Control Variables	Gender	1.973* (0.083)	2.308* (0.095)	2.363* (0.100)	1.984* (0.083)	2.375* (0.087)	2.447* (0.091)	2.161* (0.079)	2.474* (0.090)	2.597* (0.096)	2.293* (0.083)
	Age	1.293 (0.053)	1.285 (0.051)	1.430 (0.058)	1.451 (0.059)	2.727** (0.097)	2.884** (0.104)	2.939** (0.106)	2.717** (0.097)	3.117** (0.111)	2.929** (0.104)
	Education	-4.295*** (-0.181)	-4.126*** (-0.170)	-4.901*** (-0.213)	-4.657*** (-2.201)	-2.878** (-0.106)	-3.422** (-0.132)	-3.314** (-0.127)	-2.929** (-0.108)	-3.349** (-0.128)	-2.947** (-0.112)
Independent Variables	KN		5.289*** (0.210)			3.582*** (0.128)			3.887*** (0.141)		
	SK			2.766** (0.118)			2.158* (0.081)			2.570* (0.097)	
	WL				2.037* (0.085)			1.976* (0.072)			1.754 (0.063)
Mediating Variable	CC										
Moderating Variable	DG					12.543*** (0.456)	13.126*** (0.474)	13.259*** (0.478)	11.741*** (0.439)	11.135*** (0.426)	12.457*** (0.452)
	KN x DG								1.992* (0.073)		
	SK x DG									3.585*** (0.136)	
Interactions	WL x DG										3.805*** (0.137)
Model	R ²	0.049	0.093	0.061	0.056	0.287	0.277	0.276	0.292	0.293	0.299
Summary	F	9.917***	14.778***	9.436***	8.516***	46.486***	44.243***	44.036***	39.599***	39.768***	39.967***

Note. N = 583. KN = Knowledge; SK = Skills; WL = Willingness; CC = Co-creation; DG = Web-based Platform. Standardized beta in parentheses. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

Table 4
Results of hierarchical regression analysis (Cont.)

Variables		Dependent variable: e-WOM (M11 → M18)							
		M11	M12	M13	M14	M15	M16	M17	M18
Control Variables	Gender	-2.435* (-0.104)	-2.126* (-0.087)	-1.468 (-0.061)	-2.563* (-0.103)	-2.725** (-0.116)	-2.305* (-0.094)	-1.733 (-0.072)	-2.805** (-0.113)
	Age	-1.719 (-0.072)	-1.858 (-0.074)	-1.449 (-0.058)	-1.149 (-0.045)	-1.913 (0.079)	-1.962 (-0.078)	-1.614 (-0.064)	-1.326 (-0.052)
	Education	-0.512 (-0.22)	-0.158 (-0.006)	-2.452* (-0.104)	-2.493* (-0.103)	0.085 (0.004)	0.169 (0.007)	-1.877 (-0.081)	-1.920 (-0.080)
Independent Variables	KN		7.640*** (0.301)				7.066*** (0.284)		
	SK			7.257*** (0.304)				6.940*** (0.291)	
	WL				8.628*** (0.345)				8.409*** (0.336)
Mediating Variable	CC				3.380** (0.142)	1.920 (0.079)	2.699** (0.109)	2.856** (0.113)	
Moderating Variable	DG								
Interactions	KN x DG								
	SK x DG								
	WL x DG								
Model	R ²	0.017	0.107	0.099	0.129	0.036	0.113	0.110	0.141
Summary	F	3.327*	17.335***	15.883***	21.423***	5.397***	14.670***	14.302***	18.982***

Note: N = 583. KN = Knowledge; SK = Skills; WL = Willingness; CC = Co-creation; DG = Web-based Platform. Standardized beta in parentheses. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

5.4 Further Test for Mediation

A further test was conducted to test for mediation effect of co-creation through process. The process mediation has become the preferred standard for mediation analyses in consumer research (He et al., 2017). The bootstrapping method with 5000 bootstrap resamples and bias-corrected confidence estimates, and a confidence interval of 95% was applied. The bootstrapping methodology as a means of testing mediation is considered better than the Sobel test because it (Sobel test) assumes large sample sizes and that the indirect effect is normally distributed (Preacher and Hayes, 2004). In process mediation, if the confidence interval obtained through bootstrapping does not contain zero, then one can conclude that the indirect effect is significant. The test results are shown in Tables 5 and 6.

In bootstrapping, if the direct path is not significant, there is no mediation; if the indirect effect is not significant, there is no mediation (Preacher and Hayes, 2004; Hadi et al., 2016). The data presented in Tables 5 and 6 shows that co-creation has a mediating effect between all the customer operant resources and e-WOM, as both the direct and indirect paths are all significant.

In terms of direct effect, the interval of customer knowledge \rightarrow e-WOM (LLCI = 0.072; ULCI = 0.128), $p < 0.001$ does not contain 0, and therefore direct effect exist. With regard to mediating effect (customer knowledge \rightarrow co-creation \rightarrow e-WOM), the interval (BootLLCI = 0.000; BootULCI = 0.013), does not include 0, $p < 0.001$. Thus mediation effect exists. This contradict the result from the hierarchical regression in Table 4 (M16) which was insignificant. Though there is mediation effect, the effect is partial.

The interval of the direct effect of customer skills \rightarrow e-WOM does not contain 0, and so direct effect exists (LLCI = 0.499; ULCI = 0.893), $p < 0.001$. In terms of mediating effect, the interval

(BootLLCI = 0.004; BootULCI = 0.069) does not contain 0, $p < 0.001$, thus mediating effect exists. This further confirms the regression result in Table 4 (M17).

The mediating effect of co-creation between customer willingness and e-WOM in the regression result is also confirmed by the process mediation. The interval of the direct effect (LLCI = 0.271; ULCI = 0.436) does not contain 0, $p < 0.001$. Therefore, direct effect is present. The interval of the mediating effect (BootLLCI = 0.000; BootULCI = 0.026) does not contain 0, $p < 0.001$, thus mediating effect does exist.

Table 5
Bootstrapped mediator analysis

Path	Model		Coeff.	SE	T	LLCI	ULCI	Summary	Outcome
KN → CC → e-WOM	M2	KN	0.176	0.033	5.289	0.111	0.242	R = 0.304 R ² = 0.092 F = 14.778 $p < 0.001$	Co-creation
	M12	KN	0.106	0.014	7.640	0.079	0.134	R = 0.327 R ² = 0.107 F = 17.335 $p < 0.001$	e-WOM
	M16	KN	0.100	0.014	7.066	0.072	0.128	R = 0.335 R ² = 0.112 F = 14.670 $p < 0.001$	e-WOM
CC		0.033	0.017	1.920	-0.001	0.067			
SK → CC → e-WOM	M3	SK	0.671	0.242	2.766	0.194	1.147	R = 0.247 R ² = 0.061 F = 9.436 $p < 0.001$	Co-creation
	M13	SK	0.727	0.100	7.257	0.530	0.924	R = 0.314 R ² = 0.099 F = 15.883 $p < 0.001$	e-WOM
	M17	SK	0.696	0.100	6.940	0.499	0.893	R = 0.332 R ² = 0.110 F = 14.302 $p < 0.001$	e-WOM
CC		0.046	0.017	2.699	0.012	0.79			
WL ↑ ξ	M4	WL	0.212	0.104	2.037	0.007	0.416	R = 0.235 R ² = 0.056 F = 8.516	Co-creation

							$p < 0.001$		
	M14	WL	0.363	0.042	8.628	0.280	0.446	R = 0.359 R ² = 0.129 F = 21.423	e-WOM
		WL	0.353	0.042	8.409	0.271	0.436	R = 0.376 R ² = 0.141 F = 18.982	e-WOM
↑ ↓	M18	CC	0.047	0.016	2.856	0.015	0.081	$p < 0.001$	

Note: n = 583; LLCI = Lower limit confidence interval, ULCI = Upper limit confidence interval, KN = Knowledge; SK = Skills; WL = Willingness; CC = Co-creation. Coeff. is unstandardized; *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$.

Table 6

Total, direct and indirect effects of X on Y

Path	Effect	SE	T	LLCI	ULCI	Interpretation
KN → CC → e-WOM	Total	0.106	0.014	7.640	0.079	0.134
	Direct	0.101	0.014	7.066	0.072	0.128
	Indirect : CC	0.005	0.003(BootSE)		0.000(BootLLCI)	0.013(BootULCI)
SK → CC → e-WOM	Total	0.727	0.100	7.257	0.530	0.924
	Direct	0.696	0.100	6.940	0.499	0.893
	Indirect : CC	0.031	0.016(BootSE)		0.004(BootLLCI)	0.069(BootULCI)
WL → CC → e-WOM	Total	0.363	0.041	8.628	0.280	0.446
	Direct	0.353	0.042	8.409	0.271	0.436
	Indirect : CC	0.010	0.006(BootSE)		0.000(BootLLCI)	0.026(BootULCI)

6. Discussions

This research has sought to investigate the impact of specific customer operant resources on customer value co-creation and its subsequent effect on brand advocacy in the form of electronic word-of-mouth communications. According to the research results obtained, all hypotheses put forth were supported. With regard to direct relationships, customer operant resources of knowledge, skills, and willingness have statistically significant effects on customer online value co-creation. Secondly, customer knowledge, customer skills, and willingness to co-create have significant positive effect on online advocacy (e-WOM). Thirdly, online customer co-creation also has a significant direct effect on customer online advocacy. These findings are consistent with the fundamental premise four of the service-dominant logic theory (Vargo and Lusch, 2008) which states that operant resources are the fundamental source of competitive advantage, and that customer operant resources are key resources for value co-creation. The implication is that there is a positive relationship among customer operant resources, online value co-creation and electronic word-of-mouth communications. Clearly, measuring the different components of customer expertise in relation to co-creation and advocacy brings out their varied strengths. In effect, this confirms that knowledge and skills constitute key resources for value creation (Vargo and Lusch, 2004; Prahalad and Ramaswamy, 2004) and that measuring them individually as proposed by Baron and Warnaby (2011) will provide insights into how to manage co-creation of value.

With regard to the mediating role of co-creation, the data analysis revealed that co-creation statistically mediates the effects of customer knowledge, customer skills and willingness on online advocacy. The primary implication of these results is that co-creation could be used to engage customers to do product or service evangelism through positive e-WOM. Therefore,

engaging customers in value co-creation could whip up online advocacy from them. However, the lack of customer co-creation could also partially affect customers' readiness to embark on brand online word-of-mouth communication for the firm.

The results also confirm that firms' web-based platforms strengthen or moderate the relationships between customer operant resources and online co-creation. From the findings, it can be inferred that co-creation serves as a very connector between customer operant resources and e-WOM. In effect, online value co-creation platform assemblages enable the utilization of customer operant resources by firms to brand and propagate their services online. This assertion agrees with Ramaswamy and Ozcan (2016) who posited that brand value co-creation is enacted through brand engagement platforms, in this case digital platforms. In other words, the nature (ease of use, adequacy of information, the friendliness and currency) of firms' digital platforms for online co-creation engagement influences the effectiveness of customer knowledge, customer skills and the willingness of customers to engage in online value co-creation. The impact of customer operant resources on online value co-creation depends, to a large extent, on the efficiency and effectiveness of firms' digital platforms.

The result findings indicate the relevance of co-creation in stakeholder engagement and sustainable practices in environmental management, and the need for waste firms to build the capacities of their stakeholders to equip them with the necessary knowledge and skills for effective participatory and integrative environment (Kruger et al., 2018). The findings also confirm earlier studies (Kumar and Reinartz, 2016; Arnold, 2017) that value is not created by a single actor, but rather co-created by the integration of resources, knowledge, and capabilities of enterprises and their stakeholders. In other words, customer knowledge about the business context and co-creation experience, as well as his/her digital skills and willingness to co-create

are very important resources for an efficient and effective online value co-creation regarding waste management, as they have direct impacts. Thus, when customers possess specialized knowledge, are skillful and willing, engaging them in online value co-creation could result in positive and effective value co-creation. Customer engagement through co-creation would also motivate them to be brand ambassadors for cleaner environment. The opportunity is, thus, created for boosted online communication by the customers on behalf of the firm. This has competitive advantage benefits to the firm as it reduces the cost of communication to the firm, in consonance with the resource-advantage theory, and also help the waste firms and the government achieve one of their core mandates of sustainable clean environment. This is also in tandem with the conclusion of Kennedy and Guzmán (2016) that firms which open up to consumers for value co-creation are rewarded with brand building goals such as brand loyalty and brand awareness. Similarly, the findings are in agreement with the findings of Yoshida et al. (2018), Ismail (2017) and Luo et al. (2015) which agreed that online marketing and branding co-creation with consumers have significant effect on brand consciousness. An equally important revelation by this study is the fact that engaging customers through social media platforms leads to higher consumer-brand relationships and word of mouth communication (Hudson et al., 2016). Therefore, firms and practitioners can use the results of this study to effectively engage consumers through value co-creation as a strategic means to brand their services.

6.1 Theoretical Implications

This study has contributed to the advancement of literature of customer value co-creation in the waste management industry. Previous studies on co-creation in the waste and environment sectors have largely been broad in perspective (e.g., Kruger et al., 2018). This study narrowed the scope to the specific context of waste collection service firms – customers value co-creation

dyadic perspective. This gives a clearer and more specific picture of co-creation in waste collection service provision, and this makes the study a novelty and will engender further academic study in this context.

Secondly, prior research has demonstrated that customer expertise is a key determinant to successful customer value co-creation. This study advances the knowledge on customer expertise by demonstrating that customer expertise constitutes distinct components, and that their quantitative measurement can provide insights into how to manage co-creation of value. The quantitative measurement of the distinct parts of customer expertise with regard to online value co-creation, instead of their measurement as one composite factor as exist in literature (Alves et al., 2016), is better because these factors are developed from different physical, social, cultural and relational sources (Arnould et al., 2006). Indeed, the results demonstrate that customer operant resources of knowledge, skills and willingness have varied degrees of impact on online value co-creation and branding. Therefore, this study has uncovered promising new area for future work. However, this view is in connection with the service context of this study (waste collection service) and might not be applicable to other service contexts.

The recognition and quantitative measurement of customer willingness to co-create as a customer operant resource, a phenomenon which has received limited attention in academic studies. Willingness as an influential factor in value co-creation has received many mentions in extant literature. However, as posited by Neghina et al. (2017), it has not been considered a key determinant in the consumer's choice to co-create value by previous studies. This study is of the view that willingness to co-create is an internal, personal disposition, and combines with customer knowledge and skills to greatly influence customer value co-creation and customer branding efforts, especially customer brand advocacy. Thus, it should form part of customer

operant resources as espoused by the service-dominant logic, which had knowledge and skills as the main components. Therefore, this study has contributed to theoretical knowledge by categorizing customer willingness to co-create as a customer operant resource.

Previous studies on digital value co-creation have recognized the importance of firms' digital platforms as assemblages for efficient and effective value co-creation (Ramaswamy and Ozcan, 2016; Frow et al., 2015; Akaka and Vargo, 2014). Depending on the service context, the information content of a firm's digital platform will defer. Again, the type of digital platform being used by the co-creating enterprise will have impact of customer accessibility and willingness. Thus, firms' digital platforms would strengthen or otherwise customer online co-creation. Yet their quantitative influence on online customer value co-creation is limited. Few have measured the impact of firms' website quality on customer willingness to co-create (e.g., Elsharnouby and Mahrous, 2015). This study has typically shown that firms' digital platforms do strengthen the relationships between customer operant resources and online co-creation, further confirming and advancing the results of Elsharnouby and Mahrous. By providing for the influence of firms' digital platforms, this research advances the insights on online value co-creation.

Knowledge on the application of the value co-creation concept to branding of waste collection services has been advanced. A scan through extant literature indicated that there is limited customer value co-creation studies in the specific context of solid waste collection service. This study looks at co-creation from the solid waste collection service sector, in a developing Sub-Saharan country, and this sets the pace for more future research into value co-creation application in solid waste collection service.

6.2 Managerial Implications

With this results, practitioners in the waste management sector can begin to use virtual communities to co-create and to motivate stakeholders to do positive online advocacy in a form of preaching cleaner environmental practices on their (practitioners) behalf. It, therefore, requires that the right digital platforms are deployed, made accessible and useable to the customer in order to achieve the expected outcome (Frempong et al., 2018). In this regard, waste collection firms cannot design and implement co-creative process without proper digital platforms. The type, ease of use and content of the digital platforms would significantly determine customers' willingness to engage in co-creation ventures so as to achieve the desired branding outcome of positive advocacy.

Since waste management programs often seek to change attitudes of the citizens, advocacy will remain a very important function to bring about the needed change in behavior. Customers with rich knowledge and digital skills can, therefore, be used to propagate good waste management practices, as engaged customers contribute intangible resources to value creation in the form of knowledge, ideas and information to a brand through active participation in co-creation ventures (Carlson et al., 2018). As such, co-creation would serve as a link in the solid waste management sector, bringing customer intangible resources to the co-creative process, and to ensure sustainability in cleaner environment in communities and households.

Based on the findings, the study is of the view that establishing co-creation objectives, governance policy guidelines and actor roles will help the waste firms embark on meaningful online co-creative projects in solid waste management. It is proposed that waste collection firms should enter into online value co-creation with householders with certain motives or objectives. These objectives are to guide their actions with regard to their dealings with clients. They will

also serve as key performance indicators (KPI) for measuring the success or otherwise of the program. In this regard, the following objectives are proposed for the firms:

- To innovate services through digital media.
- To have access to customer resources as inputs for innovations.
- To enhance customer knowledge and experience which could be deployed in future engagements to the benefits of the firm.
- To enhance employee knowledge and experience with regard to dealing with stakeholders through digital media.
- To create customer commitment to their services and programs.

In addition to the above, management should show commitment to the co-creation venture by providing the strategic direction to the co-creation program, and by providing the needed technological infrastructure that support the running of an effective and efficient digital platforms. Ideas generated through the platforms and found creative should be implemented to motivate the larger public to be interested in participating in such ventures. Management should also spell out the benefits customers stand to gain by actively participating in value co-creation. Such incentives should be posted on the digital platforms and well communicated to the customers. Management should provide incentives to staff who excel in the management of the process. Summary of key actors' role in solid waste management co-creation is shown in Fig. 5.



Figure 5. Co-Creation Actors' Roles

Waste firms engaging in online value co-creation should also take customer satisfaction seriously. A satisfied customer would be willing to co-create and contribute ideas for value creation. It means firms should pay attention to issues that will cause disaffection or dissatisfaction among customers, and address them accordingly. By this, the waste firms should invest in customer service training and management.

6.3 Limitations of the Study

Limiting the study to a dyadic relationship might not project the full effect of co-creation on online advocacy. Recent studies support co-creation with wider stakeholder groups. Therefore, it is recommended that future similar studies broaden the scope of actors. Online data collection could be skewed. Future studies should combine online data collection with offline data collection. Further, the study focused on only one developing country. It is recommended that

subsequent studies should consider a comparative study between a developed country and a developing country. It would also be prudent to extend the study to other contexts so as to compare the impacts of customer operant resources in different business contexts.

7. Conclusions

From the discussions so far, it was realized that there are positive relationships among customer operant resources, online customer value co-creation and online advocacy. Thus, successful co-creation can boost branding through online advocacy and thereby help firms achieve competitive advantage.

Another conclusion that can be drawn is that, although all the operant resources have significant effects on co-creation, customer knowledge is very most important customer operant resource for an efficient and effective online value co-creation. This clearly demonstrate that isolating the distinct components of customer expertise or competence and measuring them separately allows firms to determine the strength of each one, and to facilitate their customer education efforts. This study has, therefore, advanced knowledge on customer co-creation by operationalizing the statistical strength of each of these key customer operant resources vis-à-vis value co-creation as opposed to the qualitative importance given to these resources by extant literature. This conclusion also fulfils the research gap identified earlier, that is, the lack of academic research on the impact of each of these customer operant resources on value co-creation.

It is also the conclusion of this study that customer operant resources can impact co-creation positively if the firm have the right platforms. The deployment of right digital platforms to engage customers online would enhance customer willingness and participation in waste management programs and value creation to yield positive results vis-à-vis positive attitude to

waste management and brand building efforts. This conclusion is based on the fact that the right digital platform permits consumers to share their personal knowledge and experiences using their technical skills, and also provides contextualized connections among online brand community members through shared experiences.

Since marketing and brand building efforts are rapidly moving onto online platforms, this study is of the view that online brand communication and advocacy in waste management would become the most effective channel for branding and marketing of waste collection services even in the less technologically developed economies.

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Declaration of interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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The Relationship among Customer Operant Resources, Online Value Co-creation and Electronic-Word-of-mouth in Solid Waste Management Marketing

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Highlights

- Customer operant resources have become imperative resources for firm value co-creation in a digitalized business world, particularly with the ever increasing servicization of offerings and digitalization of human interactions.
- Solid waste collection is a service that requires the active involvement of beneficiaries, other than the service provider, to ensure efficiency and effectiveness.
- Householders were surveyed to examine the essence of co-creation in solid waste management.
- The relationship among customer operant resources, customer value co-creation, and customer advocacy in waste management service provision is statistically significant.
- Customer value co-creation is a strategic decision making and marketing approach private waste management firms can adopt to boost customer advocacy for good waste management practices among the citizenry.