3D PRINTING IMPACTS ON SOUTH AFRICAN THIRD PARTY LOGISTIC SERVICE PROVIDERS

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ABSTRACT

Technology is the driver of industry innovations. One disruptive innovation that has implications for third party logistic (3PL) service providers is the technology of 3D printing. 3D printing enables manufacturers to produce their product at geographically remote areas no longer needing a 3PL service provider to move and warehouse products. This could result in many current services as offered by 3PLs to manufacturers, being changed. A qualitative case study methodology, to explore the implications of 3D printing for a South African 3PL provider, was employed. The research findings indicated that 3D printing impacts must be considered in terms of adaptive strategies by 3PLs if competitive advantages and customer service are to be assured in the future.

1 INTRODUCTION

1.1 Background

Third party logistics (3PL) is described as, “a relationship between a shipper and a third party which has customised offerings, and is characterised as being long-term oriented and mutually beneficial” (Cui, Hertz & Su, 2010:70). According to Petrick and Simpson (2013), Robinson (2014), Kneale (2015) and Wieczorek (2017) common manufacturer to customer supply chain activities required from 3PL services include: product transportation, freight consolidation, contract warehousing; and, distribution management. Globalisation has indeed benefited 3PLs who move huge quantities of manufactured products from point A to point B (Manners-Bell & Lyon, 2014; Gilpin, 2014). While industries are constantly adapting to technological changes, one recent change of special consideration for 3PLs is three dimension (3D) printing also known as additive manufacturing. 3D printing is described as, “the production of tangible products by means of digitally controlled machines, instead of using the solid materials, objects and moulding in the machine, a selected addition of layer upon layer is used” (Jensen, Tanev & Hahn, 2014:27). Consequently, 3D printing can deliver a product at the geographic point that a tangible product is needed using the Internet to facilitate transfer, and not using a 3PL service to physically move the product. This initiates a challenge to current methods of 3PL goods transportation. Logistics Management (2013:22) alludes to the fact that, “3D printing is poised to enhance supply chain management capabilities in many industries, changing their product manufacturing and distribution chain”. Manners-Bell and Lyon (2014) and Orr (2016) indicate that 3D printing will accelerate an adjustment by manufacturers away from mass production to limited

production runs for customer-centric customisation with 3D printing made-to-order products. De Waele (2013), Intrieri (2014), Crane and Haley (2015), Juma (2015) and Gravier (2016) suggest that benefits for manufacturers of products will be a reduced material waste, increased production flexibility and, an ability to decentralise manufacturing. 3D printing could allow for a totally, locally situated supply chain with only the plans for products being sent electronically via the Internet to end receivers as opposed to sending a tangible product (Kaltenbrunner, 2014; Kruger & Ittmann, 2014). This has implications for 3PL as service providers (DSV Worldwide, 2015; Mohr & Khan, 2015). 3PLs will need to adapt to serve their customer needs if a 3PL organisation is to remain viable, efficient and effective in the face of this technology (Robinson, 2014; PricewaterhouseCoopers, 2014; Kubáč & Kodym, 2017).

Zaleski (2015) and, Gress and Kalafsky (2015) suggest that 3PL companies will have to collaborate with manufacturing companies to respond to this technological disruption to avoid 3PL services and facilities being made redundant. 3PLs have to-date invested heavily in establishing wide networks of warehouses, specialised equipment and, expertise in logistics and distribution which may become redundant unless they now redefine service offerings to manage the 3D printing requirements from customers. Little is known about the implications of 3D printing for South African 3PL companies and the possible effects on them of 3D printing as a disruptive technology. Road transport costs in Africa are significantly higher than any other region of the world particularly true for sub-Saharan Africa owing to the great distances generally covered in the 3PL trucking (PricewaterhouseCoopers, 2018). This suggests that 3D printing solutions might be considered in African manufacturers logistic supply chains where many geographic customer regions are very remote and 3D printing can offer opportunity to cut transport costs to get there.

1.2 Problem statement

3D printing has a disruptive influence on the way many industries will use 3PL services in their supply chains. Petrick and Simpson (2013) state 3D printing technology poses a threat as to how 3PL companies continue to be useful to manufacturing companies if the latter opts for 3D printing solutions at the geographic points of their customers' needs. This may require 3PLs to reconceptualise their customer services to retain manufacturers' patronage. Although 3D printing seems to offer the opportunity to remotely and perhaps more cheaply serve far-flung customers by manufacturers, there exists a lack of information about the role South African 3PLs see themselves playing in 3D printing.

1.3 Research aim

This paper aimed to explore how one of the leading South African 3PLs considers adaptation of their customer service strategies for manufactured products in response to 3D printing technology.

2 LITERATURE REVIEW

The literature review seeks to highlight the discourse on the alignment and adaptation of customer service strategies by 3PLs in order to accommodate 3D printing. The implications of 3D printing on the future of 3PL supply chains in road transport are highlighted showing how strategic planning for change plays an important role in managing the advent of 3D on 3PL organisational performance.

2.1 Strategic adaptive change to external environment challenges

Nyadzayo and Roberts-Lombard (2010) indicate that attracting and retaining new customers is constantly evolving in this highly customer-centric era. Havenga and Venter (2011) point out that it is a continuous challenge for management to attain customer-centric service, diagnosing how to deploy valuable resources by adjusting organisational activities to deal with changing circumstances. Voortman and Makhitha (2014:1) argue that, "global competitive threats force businesses to build strategies around key products and formulate market-driven strategies that are integrated with existing relationships and supply chain strategies to deliver superb customer value". 3PLs consequently need to consider how to integrate 3D printing to enhance their customer service quality, satisfaction, loyalty and value-add. Linton (2017) notes that deriving a strategic approach to managing new technology change requires a balance to be made between a firm's existing internal systems designed to achieve organisational performance while integrating new processes to address internal execution gaps that adoption of the new technology, bring.

2.2 Impact of technology on the supply chain

Manners-Bell and Lyon (2014) and Barloworld Logistics (2015) suggest manufacturing processes with 3D printing will be progressively re-bundled in new and innovative ways at geographically remote, self-contained manufacturing facilities. These facilities will have stand-alone 3D printing machinery solutions within them along with the raw materials required to print. Cottrill (2013) views such a change as a major potential market disruptor to 3PL cargo movement if transportation from A to B and warehousing demands en-route between A and B, are reduced. Recently, Arcelor Mittal concluded a two-year partnership contract with the Dutch company MX3D which became a world leader in the adoption of large-scale 3D printing. Arcelor Mittal steel wire rods were the world's first 3D-printed rods for an MX3D bridge project (ArcelorMittal, 2015). 3D printing at the site of the bridge build diminished the requirements for product transport from a rod supplier factory to the geographic location of the new bridge.

2.3 Strategic change for customer service orientation

The 18th Annual Study on the State of Logistics Outsourcing (2014) indicated that the maturity of the 3PL industry have historically relied on manufacturers of products using 3PL companies for both transportation and storage of their products in transit. With current developments and trends in manufacturing such as 3D printing, manufactures are seeking ways to improve their own innovations in creating more value for their own customers. To maintain the role of intermediary between manufacturer and the manufacturer's customers, 3PLs have to have a manufacturer 3D printing service that is attractive to the latter. Manners-Bell and Lyon (2014) and Ryan, Eyers, Potter, Purvis and Gosling (2017) suggest that the 3D printing dynamic could ferment the development of new forms of 3PL services which include taking a role in recommending 3D printing solutions to their customer manufacturers such as: 3D printer service and parts management, remote delivery transfer of product plans (electronic) and, monitoring for manufacturers' of the remote market demand. This type of innovation would mean adoption of a co-productive strategy that offers both manufacturers and their 3PL companies an opportunity to evolve new and novel ways of doing business together. 3D printing requires 3PL companies to adjust their relationships with their manufacturers accurately aligning relationship structure with their customer's specific business needs (Zaefarian, Henneberg & Naudé, 2012; Sirichakwa & Conner, 2016; Hofman & Osterwalder, 2017).

2.4 The South African 3PL of this case study

The South African 3PL company of this case study has for confidential purposes been named 3PLA. 3PLA is a very successful 3PL, and is Johannesburg Stock Exchange (JSE) listed meaning a great deal of its financial performance and strategic data is available in the public domain from which information for this research was sourced for background to the company. Additionally, being listed in the JSE requires 3PLA to constantly address how they create value for both customers and shareholders. 3PLA currently provides a variety of services including warehousing, product distribution, and freight-transport supply chain integration bespoke solutions. 3PLA also offers a range of personalised customer solutions including facilitation of cross border goods transportation which includes freight forwarding and customs clearance. They provide synchronised logistics to customers such as automotive industries as support for the just-in-time inventory supply process adopted by many of their manufacturing customers. 3PLA road logistics extends to 14 African countries and into Europe suggesting that 3D printing might have a considerable effect on their services. It employs over 51 000 people and generates a revenue in excess of Rand 120 billion annually in Africa and Europe.

3 METHODOLOGY

3.1 Research design

The study adopted an empirical research approach as the research was based on both primary and secondary data analysis to explore the implications of 3D printing technology on the future of supply chain industries - using 3PLA as a case study (Morse, 1991). The use of a case study supported the study's interpretivist philosophy (Saunders, Lewis & Thornhill, 2009) to gain understanding of how this 3PL planned to overcome challenges and make customer service adaptations in light of changes 3D printing technology may bring (Brynard & Hanekom, 2006).

3.2 Data collection

Exploration of the impact of 3D printing on 3PLA's strategy for customer service was done by employing a qualitative research, multi-method using descriptive data to gain an understanding of the 3PLA customer service strategies and inclination to adapt to change. Secondary data was derived from the 3PLA public domain (web and newspaper) documents and empirical literature to construct a semi-structured interview guide that was then used by the researcher to interview participants. Participants were purposively selected 3PLA managers who could give insight to the 3PLA customer vision in light of 3D printing and, could assess opportunities and threats presented by this technology (Brynard & Hanekom, 2006; Kempen, 2012). The secondary data review and interviews sought to explore the effect of 3D printing on future 3PLA customer service strategy. The researcher conducted semi-structured interviews, one-on-one with seven participants from 3PLA management (three from finance, two from warehousing, and one from marketing); the seventh was from the 3PLA transport management software (TMS) section. Interviews lasted between 30 and 50 minutes and were recorded on a cell phone and then transcribed verbatim into a Word™ document by the researcher.

3.3 Data analysis

Content analysis was adopted looking for words and phrases in the 3PLA document review and participant interview transcriptions related to the theme which was to explore the effect of 3D printing on future 3PLA customer service strategy (Saunders et al., 2009; Bryman & Bell, 2011).

4 FINDINGS

Participants had 6 to 11 years' experience each as 3PLA managers indicating they had considerable experience with 3PL customer services. Participants agreed that many customers in the future will have their own 3D printing equipment but in terms of the current services 3PLA offer, the participants have confidence that most of 3PLA services could be adapted to support 3D printing. For instance: cross border transport might be reduced as the product could be printed at a delivery point but there would still be a need for a 3PL to manage customs implications; production of 3D printed products at point of delivery would still need a 3PLA warehouse to store them until delivered to the customer. As regards just-in-time inventory resupplying, a typical activity undertaken by 3PLA for its manufacturers, this might be detrimentally affected if customers such as automotive manufacturers want to print inventory parts themselves at point of delivery instead of asking 3PLA to rush an order by truck from point A to B; but, 3PLA can see themselves offering to 3D print these rush parts as a new outsourcing service. 3PLA have an advantage over the manufacturers with their network of warehouses. The manufacturer would find it a challenge to organise 3D printers remotely from their main factory across the country while 3PLA already has existing warehouse infrastructure to house 3D printers.

Participants noted that manufactures satisfying just-in-time inventory demands (printing away from their main production site) would also put pressure on manufacturing companies to recruit specialised staff to support these 3D printing demands. This could offer 3PLs' opportunities to step in with not only their warehouses but also with 3D printing production trained staff. 3PLA participants suggested that their warehouses could alternatively be used to contain customer 3D machines or, for 3PLs to buy their own 3D printers and offer 3D printing one-off printing solutions to anyone at their warehouses. The TMS manager also noted customers currently want 3PLs to provide environmentally friendly supply chain services and 3D printing could definitely address this reducing waste in terms of the 3D printing only happening when needed limiting the stock left unsold and ultimately destroyed. Kumar, Teichman and Timpernagel (2012) found that greener supply chain management does indeed result from better planning of TMS functions. 3D printing would also definitely reduce 3PL road route carbon production through fewer kilometres travelled. All managers indicated a willingness to adapt 3PLA services to support 3D printing noting that as 3D printer warehouse providers they will probably correspondingly evolve to become 3D printer raw material storage distribution centres. From a warehouse management perspective 3PLA managers believed that 3PLA might take on mobile 3D printing solutions sending out smaller trucks equipped with 3D printers and support staff benefitting small product batch manufacturers. 3PLA believed that many small manufacturers would not want to make an investment in custom made 3D printing delivery vehicles so 3PLA could pick up this service. Management indicated that they can see opportunity in the immediate future as lack of knowledge about 3D printing by customers and its cost to set-up will make customers relying on 3PLs who can provide 3D printing services. Participants also suggested that small-scale 3PL companies may be detrimentally affected by 3PLs adopting the technology to their customer services, being unable to afford the large-scale 3D printing support 3PLs will be

able to offer. Management also indicated that 3D printing by 3PLs for customers at remote locations could offer job opportunities to rural area people.

5 CONCLUSION AND RECOMMENDATIONS

The introduction of 3D printing as a 3PL service could radically change 3PL customer services while contributing to a greener environment. The study findings supported the literature in that 3D printing is a disruptive technology requiring South African 3PLs to adapt current service offerings. Overall, the managers of this large 3PL saw opportunities to continue to optimise a profitable customer-service-orientated logistics environment. The same environment however may be a threat to smaller 3PLs who cannot afford the costs of 3D printing adaptation. Fears of unoccupied 3PL warehouse space seemed unfounded with the sanction that 3D printing is welcomed as an opportunity. Existing 3PL storage warehouses can be turned into 3D printing facilities and holding spaces for the raw materials printing requires ultimately providing a new range of customer services. Managerial implications drawn from these findings are that South African 3PLs will need to plan ahead for these changes in marketing adapted customer services brought about by the 3D printing technology. They will need to ensure customers continue to see 3PL services as indispensable refocusing the partnerships between 3PL companies and their customers to integrate 3D printing through 3PL investment in 3D printing equipment and supporting processes.

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