Demand planning approaches employed by clothing industry stakeholders in Gauteng, South Africa

Introduction
The status of the South African clothing industry reflects a low-income market and low productivity (Fibre Processing Manufacturing Seta [FP&M Seta] 2014:3; Nattrass & Seekings 2012:7). Seen in this light, it is crucial to plan for demand in the clothing industry because clothes are regarded as highly desirable products, symbolising the status quo of individuals (Hong 2015:323). In 2012, many clothing manufacturers relocated their factories to bordering countries, while in some instances, the challenges were so serious that some clothing factories closed down their operations completely (Nattrass & Seekings 2012:7). The number of clothing manufacturers in South Africa is still declining (Isaacs 2016). The reason, according to Isaacs (2016), is because of imports from other countries, which had a detrimental effect on their operations. The current research was conducted in a quest to determine the approaches to demand planning adopted by the South African clothing industry, particularly in the Gauteng province, to determine whether proper demand planning can add value to the South African clothing industry.

Demand planning approaches are critical in the decision-making processes of production organisations (Belmokhtar, Herrera & Thomas 2010:1). Production organisations often adopt certain approaches to reduce the complexity of production processes when planning for customer demands (Albey & Bilge 2011:3320). Demand planning approaches, such as the modelling of uncertainties, aggregation and disaggregation of processes, and the replacement of random processing with averages are commonly used by production organisations (Nielsen & Steger-Jensen 2006). Manufacturing organisations realise that for these approaches to succeed in reducing production complexities, either a hierarchical or an optimal approach to production decision-making must be established (Nielsen & Steger-Jensen 2006).

Problem statement
Hierarchical and optimal demand planning approaches are perceived to assist production organisations in making appropriate decisions on production planning based on the product.
The South African clothing industry stakeholders

The South African clothing industry comprises three key stakeholders: fabric suppliers, fashion designers and clothing manufacturers.

Fabric suppliers

Fabric is crucial in the clothing industry because it is used to produce final garments in various styles and colours. Therefore, fabric suppliers can be seen as some of the main contributors to the functioning of this industry. Demand planning in the clothing industry should, however, start with the suppliers of raw materials that are essential for the manufacturing of fabric. Fabric is made by spinning yarns produced from, among others, cotton or wool. South Africa is a top producer of wool for the production of clothing fabric, and the country is also one of the top five mohair-producing countries in the world. In addition, South Africa harvests 40 000 tons of cotton on an annual basis (SouthAfrica.info 2015). There are 3400 cotton suppliers and 15 000 wool suppliers in South Africa (Salm 2002:17). Raw materials, like cotton or wool, are ordered from first-tier suppliers for use in the manufacturing plant. Processing machines transform these raw materials into fabrics (Isenheim 2006:4). Clothing factories can then order the fabrics for the production of clothing from the second-tier suppliers such as A B C Fabrics, A T Textiles CC Adam N Eve Fabrics, Adonis Knitwear Holdings (PTY) LTD and many other second-tier suppliers (Schreiber 2013; Southern African Clothing and Textile Workers Union [SACTWU] 2012).

Fashion designers

Fashion design is a form of artistic talent that is devoted to the construction of garments and other decorations or trims (Fibre2Fashion.com 2017). Fashion designing involves the creation of various clothing items according to fashion trends that have a relatively short life cycle (Williams 2015:12). According to Oberhofer (2012:67), fashion designers are more involved in creating various clothing brands than clothing manufacturers are. As fashion originated from global cities such as Paris, London and New York (Oberhofer 2012:65), the fashion industries in these cities are, therefore, regarded as the main fashion trend setters. Fashion centres that have existed for many decades are still operating today and still dominate the production of fashion clothes in various states and regions (Skov 2011:139). Fashion production is controlled by market forces consisting of individual requirements and desires (Shen et al. 2013:266).
As a result, the fashion industry has been divided into two different industries: one producing international garments and the other producing domestic clothing styles (Skov 2011:138). In the 1920s and 1930s, Paul Poiret from Paris started to include African designs in his creative clothing designs (Oberhofer 2012:66). Thus, Africa became involved in global fashion, which resulted in the growth of fashion in African countries. This resulted in an increase in the number of fashion designers in African countries, including South Africa (Oberhofer 2012:83).

South African fashion designers are competing in the global fashion world (Oberhofer 2012:67). According to Skov (2011:138), fashion centres are localised where fashion design is conducted. In South Africa, fashion centres were established in the city of Johannesburg, where style makers such as Stoned Cherrie were established and have been developing (Oberhofer 2012:71). State initiatives have assisted Stoned Cherrie to become one of the leading fashion brands in South Africa. Other South Africa fashion brands include, among others, Luxion Kulcha, Thula Sindzi, Black Coffee, African Queen and Thunderstorm (Schreiber 2013). According to the SA fashion week (2015), 72 fashion designers were identified in the Gauteng province. Oberhofer (2012:71) confirmed that luxury fashion brands include fashion designers who operate as owners of small clothing organisations in Gauteng.

Clothing manufacturers

Clothing manufacturing is critical because clothes are a basic requirement for all people (Chaudhary 2011:2). According to the report from SACTWU (2012), some of the clothing manufacturers that are situated in Gauteng, South Africa, are New Age, Navada, Thorn clothing, Millenium Fashion Manufacturing CC and many more. Clothing manufacturers are directly involved in producing basic clothes and fashion clothes from the fabric that was manufactured by fabric suppliers. Authors, such as Nattrass and Seekings (2012:6) and Staritz and Morris (2013:9), posit that some clothing factories form the cut, trim and make (CTM) industry. The CTM factories are the ones accountable for cutting and trimming clothing fabrics and making complete garments according to the requirements of clients. Clothing production factories can outsource the manufacturing of clothes to the CTM factories to meet clothing demands. However, the manufacturers have the final say when it comes to designing the clothes they require (Staritz & Morris 2013:9).

The key clothing industry stakeholders – fabric suppliers, fashion designers and clothing manufacturers – each have a unique character and function. Their roles and responsibilities towards clothing production differ. However, each one’s special attributes make a valuable contribution towards improving the industry’s productivity. This can clearly be seen in the clothing value chain illustrated in Figure 1.

From Figure 1 it is clear that the expertise of each of the three clothing industry stakeholders is required for the functioning of the clothing industry. Their expertise also contributes towards improving the economic wealth of the country, as they are involved in satisfying the needs of retail stores and clothing customers. In order to meet customers’ demands they need to plan properly by making use of different demand planning approaches.

Approaches to demand planning

Demand planning can be defined as the estimation of customer needs and other planning measures, as well as actions that illustrate planning in conjunction with other participants in the value chain (Rexhausen, Pibernik & Kaiser 2012:269). Organisations can use various demand management approaches to make sound decisions in their manufacturing processes that will alleviate improper demand planning practices (Bowersox et al. 2013:139). Sethi et al. (2002:6) distinguish two generic types of demand planning approaches, namely, the hierarchical and optimal approaches. These approaches are perceived to assist production organisations to make appropriate production planning decisions to meet product demand. The hierarchical and optimal approaches are considered to be production improvement decision approaches.

Hierarchical demand planning approach

The hierarchical approach was introduced in 1990 by Bertrand and Wortmann (Albey & Bilge 2011:3319). It is considered relevant to assist organisations with production decisions across value-chain linkages (Pycraft et al. 2013:13). The hierarchical approach plans to solve the problem by using various dimensions in the product planning decision-making process (Belmokhtar et al. 2010:1). This demand planning approach tool separates operation process challenges into smaller sub-challenges that can be managed with a suitable managing tool, gathering products and subsequently separating them into smaller sub-units (Belmokhtar et al. 2010:1; Sethi et al. 2002:6). This implies that the hierarchical planning approach is based on decisions which include all the dimensions in the production plan for products.

According to Pycraft et al. (2013:13), it is important to consider the following three groups that are involved in demand satisfaction when planning for demand in the
manufacturing plant: external suppliers, internal suppliers and internal customers. This suggests that there is a need for production decision plans to be separated across various organisational dimensions and supply chain networks to improve demand planning. Thomassen (2014:13) adds that demand planning in the clothing industry is a challenge as the industry constitutes various stock keeping units (SKUs), which become a challenge when product grouping is performed. As a result, uncertainties will emanate when planning and scheduling clothing production. The hierarchical approach aims to reduce these uncertainties by determining the necessary resources required for each specific product group in the value chain network (Belmokhtar et al. 2010:1). Manufacturing equipment, material handling, backlogs, actual manufacturing and the inherent cost are taken into account (Albey & Bilge 2011:3322).

The hierarchical approach accepts that production decisions should combine either various dimensions in the organisation or the partners in the product value chain without any interventions (Nielsen & Steger-Jensen 2006:2). The hierarchical approach combines the volumes of production per product group for a specific production in an unlimited period and incorporates several plans (Nielsen & Steger-Jensen 2006:2). In addition, the hierarchical approach operates effectively in a stable production process. Nielsen and Steger-Jensen (2008:58) suggest that it should be used in intermediate-to large-volume operations with the aim of minimising the total cost of production.

A summary of the characteristics of the hierarchical approach to production demand planning is presented in Figure 2.

**Optimal demand planning approach**

The optimal approach is also one of the demand management approaches, which assist in the production decision-making of organisations (Albey & Bilge 2011:3320). The optimal approach is a relevant tool that can be used to address short manufacturing plans, multiple production processes, and also in anticipating real capacity utilisation (Sethi et al. 2002:6). It is important to acknowledge that production planning and scheduling become a challenge when there are fluctuations in product demand (Nenni, Giustiniano & Pirolo 2013:4). Hence, when planning for clothing production, short- and long-term planning periods need to be taken into consideration (Thomassey 2014:12). Where organisations face vigorous interventions across various operational dimensions in their supply chain networks, the optimal approach is crucial to ensure quick responses in the production planning processes (Nielsen & Steger-Jensen 2008:57).

When evaluating the production capacity for product demand planning, it is crucial that the facility should be able to implement the required changes to the production aspects (Albey & Bilge 2011:3320). Challenges regarding scheduling and time, anticipated capacity, equipment and manufacturing blockages need quick decisions for operational control (Albey & Bilge 2011:3322). This necessitates a flexible control system for short-term planning (Sethi et al. 2002:6). The optimal approach is suitable for dealing with these kinds of challenges, as well as the challenges posed by multiple production processes and the utilisation of real capacity (Sethi et al. 2002:6). Operational solutions are gathered in the short term to satisfy the changing demand when dealing with these uncertainties in the production capacity (Sethi et al. 2002:6).

The optimal approach aims to reduce the overall costs of operation and stock holding (Sethi et al. 2002:6). This is performed through grouping products of similar production cost, inventory cost, seasonal demand and product type together in a flexible production run (Nielsen & Steger-Jensen 2008:58).

Figure 3 presents a summary of the characteristics of the optimal approach.

The hierarchical and optimal approaches to demand planning assist manufacturing organisations in making decisions on the following: individual processes, information planning, material requirements and the utilisation of production capacity (Belmokhtar et al. 2010:1). However, there are differences between the two approaches as explained in Table 1.

Table 1 explains the difference between the hierarchical and optimal demand planning approaches. Both may be considered as effective for production planning of some categories in the clothing industry. However, the hierarchical demand planning approach seems to operate effectively on large-scale stable operation processes with minimal uncertainties (Nielsen & Steger-Jensen 2006:2). In contrast, the optimal demand planning approach seems to function more efficiently in small flexible production operations with lots of production uncertainties (Sethi et al. 2002:6). Thomassen (2010:471) indicated that, in terms of clothing manufacturing, basic clothes are stable and constitute long manufacturing processes, whereas fashion clothes constitute constant changes and require short manufacturing processes (Oyatoye & Fabson 2011:17). This demonstrates that the hierarchical demand planning approach may be suitable for making decisions regarding the production of basic clothes, while the
The study followed a convenience non-probability sampling technique, as explained by Etikan et al. (2015:1). According to Etikan et al. (2015:1), the convenience sampling technique can be used when selecting a population that poses many restrictions because of the particular nature of the population. The key criteria used when selecting the population was based on the expertise of the respondents regarding demand planning in the clothing industry. A structured questionnaire was administered using a five Likert-scale response format administered to 56 key stakeholders in Pretoria and Johannesburg. The stakeholders consisted of 18 fabric suppliers, 26 clothing manufacturers and 12 fashion designers. The structured questionnaire was administered to clothing industry stakeholders such as managers and supervisors. To validate the research instrument, a pre-test was conducted. The questions were modified and
refined accordingly based on feedbacks. For reliability, a consistent procedure was followed in the administration and analysis of the collected data.

Ethical considerations

Voluntary and anonymous questionnaires were emailed or hand-delivered to a sample of 56 respondents in the Gauteng clothing industry after obtaining permission from the Department of Department of Transport Economics Logistics and Tourism (TELT) and from the Department of Postgraduate Studies at the University of South Africa in 2011. The research proposal and the questionnaire were reviewed and approved by the ethics team. Cooper and Schindler (2011:252) declare that a questionnaire emailed through a personal computer provides more privacy than other methods of communication. A letter informing the respondents that the questionnaire was voluntary and that the information would be used for the purposes of completing a master’s degree was sent to and signed by the respondents. A consent form was also sent to the respondents to confirm that they agree to complete the questionnaire.

With regard to ethical consideration, the respondents’ consents were sought during the data collection process. The structured questions were analysed by means of SPSS.

Results and discussion

This section of the article presents the results and discussion of the structured questions. It begins with the demographic profiles of the respondents and followed by demand planning approaches employed in their organisations. The findings are presented using figures and tables.

Demographic profile

This section of the findings discusses the distribution of the clothing industry stakeholders as well as job positions of the clothing industry.

The distribution of the clothing industry stakeholders

Table 2 presents the distribution of the three key clothing industry stakeholders in percentages.

As shown in the Table 2, there are three stakeholders in the clothing industry. Of the clothing industry, 46.4% were clothing manufacturers – thus nearly half of all the respondents. Fabric suppliers made up 32.1% and 21.4% were fashion designers. This shows majority of the three key clothing industry stakeholders were clothing manufacturers.

The job position

The job profile of the clothing industry is discussed in the subsection. Table 3 presents the job profile of the respondents in percentages.

As indicated in Table 3, the clothing industry stakeholders held various positions. Most of the clothing industry stakeholders were fabric specialists (32.1%) followed by company owners (23.2%) and operation managers (21.4%). Minority of the clothing industry stakeholders were company directors (1.8%), head of clothing supply chain (1.8%), production supervisors (1.8%) and specialist graphic designers (1.8%). This indicates that majority of the respondents in this study were fabric specialist, company owners and operations managers.

Demand planning approaches employed by industry stakeholders

This subsection discusses findings on demand planning approaches employed by the key three stakeholders in the Gauteng clothing industry. To determine the approaches adopted by the respondents, the respondents were presented with 12 statements relating to the characteristics of demand planning approaches. The demand planning practices questions were measured using a five-point Likert-type response-format scale with 1 indicating ‘strongly agree’ and 5 ‘strongly disagree’. These statements and the respondents’ responses are graphically presented in Figure 4 and summarised in Table 4.

More than 49% of respondents agreed and strongly agreed with statements relating to the characteristics of demand planning approaches. Figure 4 graphically presents the percentage of respondents who were in agreement with the various statements.

From Figure 4, it is clear that more than 50% of the three key clothing industry stakeholders are in agreement with the statements relating to demand planning approaches. As indicated in Figure 4, majority (over 80%) of the respondents are in agreement with statements A1.3, A1.2 and A1.1 on the hierarchical approaches, namely that:

- It is necessary to conduct follow-up on material shortages with suppliers (80.30%).
- It is important that manufacturers inform retail stores about stock shortages or any production problems (85.70%).

<table>
<thead>
<tr>
<th>Position</th>
<th>Percentage</th>
</tr>
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<tbody>
<tr>
<td>Clothing designer specialist</td>
<td>3.6</td>
</tr>
<tr>
<td>Company director</td>
<td>1.8</td>
</tr>
<tr>
<td>Company owner</td>
<td>23.2</td>
</tr>
<tr>
<td>Fabric specialist</td>
<td>32.1</td>
</tr>
<tr>
<td>Fashion specialist</td>
<td>3.6</td>
</tr>
<tr>
<td>Head of clothing supply chain</td>
<td>1.8</td>
</tr>
<tr>
<td>Merchandise specialist</td>
<td>5.4</td>
</tr>
<tr>
<td>Operation manager</td>
<td>21.4</td>
</tr>
<tr>
<td>Production supervisor</td>
<td>1.8</td>
</tr>
<tr>
<td>Sales and operation manager</td>
<td>3.6</td>
</tr>
<tr>
<td>Specialist graphic designer (clothing)</td>
<td>1.8</td>
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</tbody>
</table>
Continual reviewing of the product process of the supply of clothes is important (82.2%).

Over 70% of the respondents were also in agreement with statements A1.12, A1.8 and A1.4 on the hierarchical approaches, namely that:

- Having manufacturers who think upfront and react to market changes is crucial (78.6%).
- Manufacturing processes can only be finalised when customers’ orders and specifications are confirmed (76.8%).

Over 60% of the respondents agreed with statements in A1.9, A1.6 and A1.5, namely that:

- Storing garment details according to size, colour and design is crucial (62.5%).
- It is important to have short-term manufacturing plans for fashion clothes (62.5%).
- The manufacturing of clothes must be completed before the sales season starts (69.6%).

The least 50% to 59% of the respondents agreed with statements A1.11, A1.10 and A1.7 that:

- Basic clothes are stable and result in low variances when predicting future demand (50%).
- There is a lack of capital equipment in clothing manufacturing industries in South Africa (53.6%).
- Long-term manufacturing plans may exist for basic clothes (58.9%).

All these statements are presented in Table 4. The statements relate to the characteristics of demand planning approaches, which the three key clothing industry approaches adopt.

Table 4 indicates two types of demand planning approaches, which the three key clothing industry stakeholders may seem to adopt when making production decisions.
From Table 4, it is clear that respondents agreed with the following statements A1.2, A1.4, A1.5, A1.6, A1.8 and A1.12, which relate to the optimal approach. The respondents agreed that:

- It is important that manufacturers inform retail stores about stock shortages or any production problems (85.7%).
- Manufacturing processes can only be finalised when customers’ orders and specifications are confirmed (76.8%).
- The manufacturing of clothes must be completed before the sales season starts (69.6%).
- It is important to have short-term manufacturing plans for fashion clothes (62.5%).
- Having manufacturers who think upfront and react to market changes is crucial (78.6%).
- During a period of recession, it is important to manufacture clothes in small batches (71.4%).

The respondents were also in agreements with statements A1.1, A1.3, A1.9 and A1.10, which relate to both the hierarchical and the optimal approach, namely that:

- Continual reviewing of the product process of the supply of clothes is important (82.2%).
- It is necessary to conduct follow-up on material shortages with suppliers (80.3%).
- Storing garment details according to size, colour and design is crucial (62.5%).
- There is a lack of capital equipment in clothing manufacturing industries in South Africa (53.6%).

As indicated in Figure 4, both approaches are pursued by key stakeholders in the clothing industry. For example, when planning fashion clothes, fashion clothes are perceived to constitute small flexible production operations with many production uncertainties. These findings support the findings conducted by Sethi et al. (2002:6), which indicates that the optimal demand planning approach seems to function more efficiently in small flexible production operations with lots of production uncertainties. Also, the study conducted by Thomsasse (2010:471), which states the characteristics of basic clothes are stable and constitute long manufacturing processes, whereas fashion clothes constitute constant changes and require short manufacturing processes.

Authors such as Albey and Belge (2011:3320) alluded that optimal approach is also one of the demand management approaches, which assist in the production decision-making of organisations. This article presents two general approaches to demand planning practices that can be used in improving manufacturing performance as well as decision making in the clothing industry. The hierarchical demand planning approach is recommended on basic clothes, as basic clothes constitute large-scale stable operation processes with minimal uncertainties. The optimal demand planning approach is recommended for fashion clothes as it accommodates seasonal demand changes and the various fashion seasons. However, it is important to indicate that the adoption of these demand planning approaches depends on the product offering.

**Conclusion**

This article investigated demand planning approaches employed by the clothing industry stakeholders in Gauteng. A descriptive and exploratory survey was conducted among clothing industry stakeholders in Gauteng. Two demand planning approaches, namely, the hierarchical and optimal approaches are applicable in the clothing industry. Hierarchical demand planning approach seems to be more effective for basic clothes as they have a planning horizon of 12 months while optimal demand planning approach seems to be more effective for fashion clothes because they have a planning horizon of 6 months.

The article, therefore, suggests conditions under which clothing organisations can apply the approaches to demand planning in order to improve demand planning in their organisations. The article, therefore, contributes to the clothing industry in Gauteng, South Africa, by identifying the critical demand planning approaches that are worth considering when making manufacturing decisions to meet customer demand. It suggested that the clothing industry adopts the implementation of both the hierarchical and the optimal approaches in production demand planning. The key clothing industry stakeholders should apply the optimal demand planning approach to:

- improve demand forecast of clothing needs, especially regarding fashion clothes which change more often that basic clothes
- ensure that production takes place according to the maximum rate for the clothing stock level
- produce clothing garments on demand if the stock level is equivalent to the threshold.

The article deviates from other studies conducted in clothing industry of South Africa as it focuses mainly on demand planning approaches adopted by the clothing industry stakeholders in production planning. Studies conducted in South Africa focused on various components of demand planning such as planning for fashion clothes, scheduling, imports, forecasting, recession and wage settings. A limitation of the article is that only key clothing industry stakeholders in Gauteng (fabric suppliers, clothing manufacturers and fashion designers) were selected. It is not known whether the findings would have been different if all stakeholders in the country were part of the study. It will be important for other researchers and practitioners to draw lessons from this study to investigate demand planning practices in other parts of the country as well as the global community.

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Competing interests
The authors declare that they have no financial or personal relationships that may have inappropriately influenced them in writing this article.

Authors' contributions
N.J.M. and I.M.A. contributed to the writing of the article. This article is derived from the MCOM dissertation of N.J.M. I.M.A. was the supervisor of the MCOM dissertation.

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