



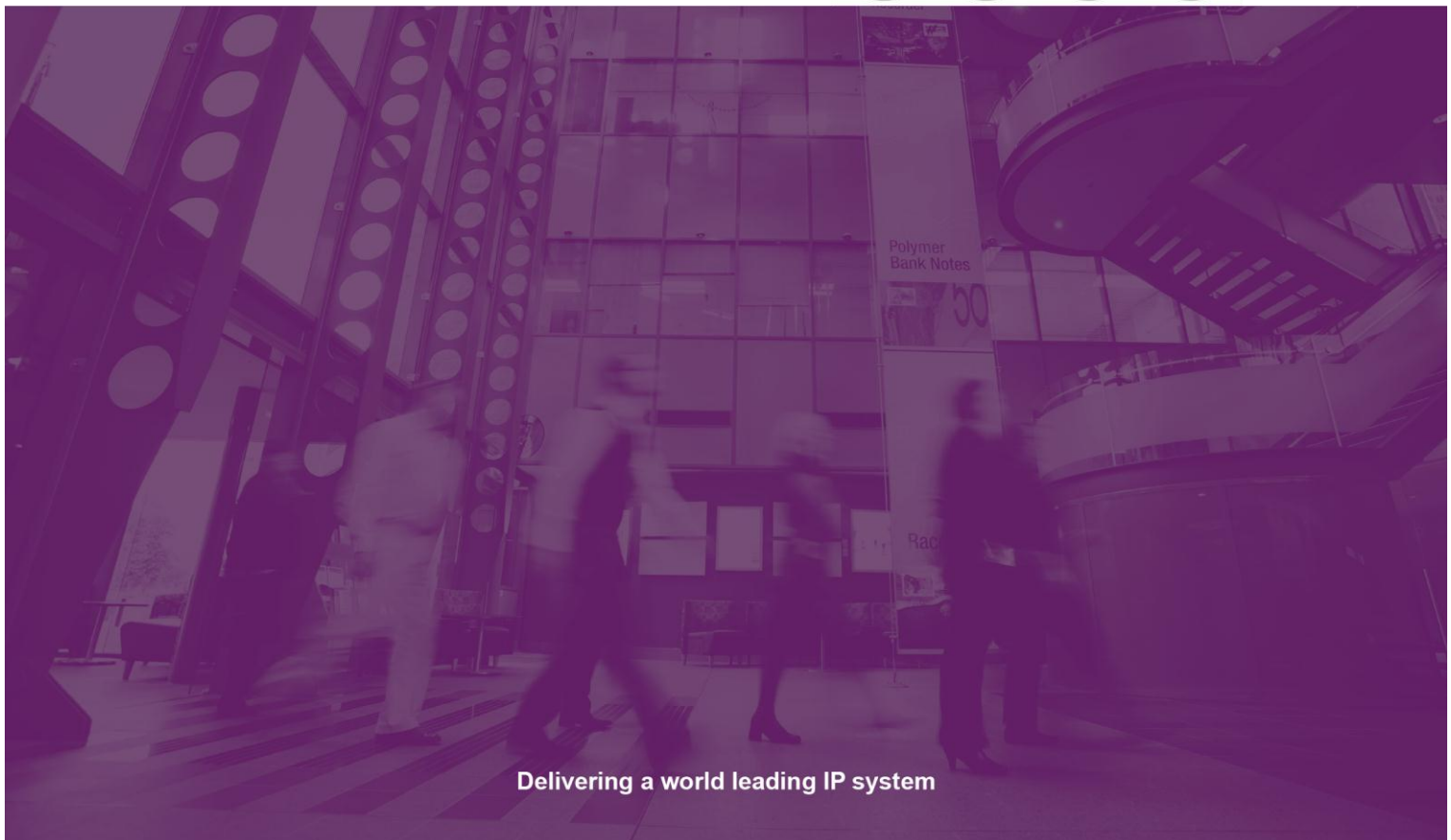
Australian Government

Department of Industry and Science

IP Australia

An intellectual property study of the Australian textiles, clothing and footwear industry

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Delivering a world leading IP system

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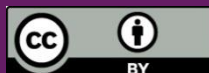
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The information contained in this brief has been gathered from global intellectual property (IP) databases and represents a snapshot of IP rights in the textiles, clothing and footwear industry at a particular point in time. It is provided for general information only and should not be relied upon for the purposes of any particular matter. It is not a report on patentability or freedom to operate and should not be relied upon for those purposes.

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Executive summary

The textiles, clothing and footwear (TCF) industry is an important sector of the Australian economy. The sector comprises more than 7000 firms, and employs more than 36 000 people, many in regional Australia.¹

The TCF industry in Australia comprises a wide range of heterogeneous products and technologies. Products and technologies in this diverse industry include: clothing; shoes; sports and footwear; medical and biomedical products such as bandages, nappies and transdermal patches; blinds and awnings; advanced composites for industrial use and personal protection; as well as fibre treating and manufacturing technologies.

This report analyses the Australian TCF industry through the lens of intellectual property (IP). It uses the scale and intensity of patent activity, as well as trade marks and designs related to the TCF industry, to provide an overview of innovation originating from Australia.

We identified 590 Australian-originating Patent Cooperation Treaty (PCT) applications with a priority date between 1 January 2000 and 31 August 2012. Whilst there was a general increase in filings over the study period, this is a relatively low number of PCT applications compared to the total number of Australian PCT applications.

The most prolific patent applicant is the Commonwealth Scientific and Industrial Research Organisation (CSIRO) with 24 applications, followed by Ansell with 11 applications and Australian Wool Innovation (AWI) with six. Only 62 of the 541 applicants in this study, or 11 per cent of applicants, filed two or more PCT applications. Therefore, 89 per cent of applicants filed just one PCT application, which is a very high proportion, compared to other industries in the same time period.²

The technological subsectors where most inventions occur are clothing and homewares, along with medical applications of textiles. There is some evidence that government grants that connected researchers with industry partners have led to innovation. Both the CSIRO and Deakin University have worked with small-to-medium enterprises (SMEs), helping them to remain competitive, and leading to patentable inventions.

We identified a total of 66 515 unique trade mark applications associated with the TCF industry. When looking at the prominent applicants, however, the majority were filing only as part of a branding strategy and not because they were adding to innovation in the area. Therefore, we limited the trade mark applicants to those who also filed at least one patent which resulted in 1087 trade mark applications. The major applicant was Pacific Brands, who filed 27 per cent of these trade marks.

Designs were a major source of innovation in the TCF industry with 6611 applications filed in the period, an order of magnitude more than patent filings. Whilst the total number of Australian design applications for all products across all technologies has trended down since 2010, the number of TCF design applications has remained steady. Most designs were directed to clothing, with prominent applicants including Forever New, JETS Swimwear and Review Australia. Patent applicants tended not to use design rights, with only 316 design applications filed by patent applicants in the same time period. Of these, 47 per cent (149 applications) were filed by two foreign companies—Kimberly-Clark Worldwide and SCA Hygiene Products—who were co-applicants with Australian patent applicants.

A trend across all IP rights analysed was that the majority of applicants, by firm type, were individuals or SMEs. Our analysis also showed that there was little overlap between the major applicants in each IP right, suggesting the different sectors of the industry use IP rights differently.

¹ Textiles, Clothing and Footwear (TCF) Industry Capability Map: Textiles, Department of Industry, 2013

² See, for example, IP Australia (2014), '[The Australian food industry: a patent analytics report](#)' or IP Australia (2014), '[Australian Medical Devices: A Patent Analytics Report](#)'

Glossary

ADC	Australian designs classification
ANZSIC	Australian and New Zealand Standard Industrial Classification
AusPat	IP Australia's online database containing patent applications filed and granted in Australia
AWI	Australian Wool Innovation
CSIRO	Commonwealth Scientific and Industrial Research Organisation
EPO	European Patent Office
HAN	OECD harmonised applicants' names
IP	intellectual property
IPC	International Patent Classification
IPGOD	Intellectual Property Government Open Data
LOC	Locarno classification
NCL	Nice Classification
NPE	national-phase entry
OECD	Organisation for Economic Co-operation and Development
PATSTAT	EPO worldwide patent statistical database
PCT	Patent Cooperation Treaty
REGPAT	OECD 'regionalised' patent database
SME	small-to-medium enterprise
TCF	textiles, clothing and footwear
WIPO	World Intellectual Property Organization

1 Introduction

This report analyses the Australian TCF industry through the lens of intellectual property (IP). It uses the scale and intensity of patent activity, trade marks and designs related to the TCF industry, to provide an overview of innovation originating from Australia.

The following questions are explored in relation to the Australian TCF industry:

- Which Australian TCF companies are filing patents, and in which technology areas?
- Which areas, if any, are areas of technological strength?
- Where are the target markets for TCF inventions?
- Is innovation by patent holders also represented by trade marks and designs?
- Which Australian TCF companies are filing trade marks and designs, and are there any trends in the innovation and marketing of products?
- What is the role of collaboration and knowledge transfer in TCF innovation?

1.1 Intellectual property analysed

This report uses three types of intellectual property rights in the analysis of the textiles industry—patents, trade marks and designs.

1.1.1 Patents

A patent is a right that is granted for any device, substance, method or process that is new, inventive and useful. Australian patent rights are legally enforceable and give the owner exclusive rights to commercially exploit the invention for a period of up to 20 years. Examples of innovation in the TCF industry that might be eligible for patent protection include the development of a novel fibre manufacturing process or new advanced bandages.

There are two major filing routes for patent applications: international and direct.

The international route involves filing a Patent Cooperation Treaty (PCT) application, which establishes a filing date in all 148 contracting states.³ Subsequent prosecution at national phase patent offices, referred to as national-phase entry (NPE), is made at the discretion of the applicant. A PCT application must enter the national phase to proceed towards grant. A patent can only be enforced once it has been granted. Applications generally relating to the same invention but filed in different countries are known as patent families. Patent families enable us to analyse inventive activity regardless of the number of countries in which protection is sought. Direct applications are only filed in the countries of interest.

1.1.2 Trade marks

A trade mark is a right that is granted for a letter, number, word, phrase, sound, smell, shape, logo, picture and/or aspect of packaging. It is a distinctive sign that identifies a product or service. A registered trade mark is legally enforceable and gives the owner exclusive rights to commercially use, license or sell it for the goods and services under which it is registered. The holder of the trade mark can prevent unauthorised use of the trade mark or a confusingly similar mark, so as to prevent consumers and the general public from being misled. Trade mark registration can be extended indefinitely, as long as it is in use. Trade marks can be associated with both high- and low-technology products. This might include the patentable technology as described above, but could also include products without patent protection, such as clothing or bedding lines.

³ WIPO, [List of PCT Contracting States](#)

1.1.3 Designs

Industrial designs protect the appearance of products which have industrial or commercial use. A design specifically refers to the features of shape, configuration, pattern or ornamentation which give a product a unique appearance, and must be new and distinctive. Industrial designs are broad and cover many sectors including digital media, fashion design, furniture design, graphic design and textile design.

In the textile industry, design refers to the overall appearance of a textile product, including visual features such as a skirt with ruffles, or the cut or decorative pattern on a shirt. Design rights are only enforceable once examined and certified. A certified design gives the owner the exclusive right to commercially use, licence or sell their design. The maximum term for design protection is 10 years.

1.2 Intellectual property as an indicator of research performance

Each IP right can be used as an indicator of research and innovation, although they reflect differing aspects.⁴ A patent is more likely to reflect a significant technological innovation, whereas a trade mark or design is more likely to reflect a product coming to market.

It is a requirement of patent law that patent documents are published and that they fully disclose inventions. As a result of the disclosure requirement, the patent documents reflect developments in science and technology. Patent documents include other useful information, such as International Patent Classification (IPC) marks, and information about inventors and applicants.

Through the extraction and analysis of data associated with patent documents, it is possible to measure aspects of inventive activity such as scope, intensity, collaboration and impact. These metrics can be developed across technology sectors and by various units of measurement, such as individuals (inventors), institutions (applicants), regions and countries.

Trade marks and designs data are also published and, like patents, can provide information about applicants and technology areas. Whilst patents are proxies for innovation in high-technology industries, they are not necessarily associated with innovation in low-technology industries, or industries that have a high product turnover.⁵ In these industries, such as clothing or furniture, trade marks and designs may be more relevant markers of innovation.

1.3 Definition of Australian TCF patents, trade marks and designs

This study focussed on patent applications of Australian origin filed through the PCT route. We classified patents as being of 'Australian origin' when at least one inventor or applicant had an Australian address.⁶ States and territories are linked with PCT data according to the address of the patent applicant and inventor. The inventor is the person responsible for the creation of the idea, whilst the applicant is the person or entity that applies for the patent. The inventor and the applicant can be the same entity, or the applicant can be an entity to whom the inventor has assigned their rights, such as the inventor's employer. There may be more than one inventor or more than one applicant on a single application.

Patent, trade mark and design data were extracted from the Intellectual Property Government Open Data (IPGOD) published by IP Australia. The IPGOD includes over 100 years of IP rights administered by IP Australia comprising patents, trade marks, designs and plant breeder's rights. The data is highly detailed, including information on each aspect of the application process, from

⁴ Griliches, Z. (1998), '[Patent Statistics as Economic Indicators: A Survey](#)', R&D and Productivity: The Econometric Evidence, University Chicago Press; Schautschick, P. & Greenhalgh, C. (2013) '[Empirical Studies of Trade Marks: The Existing Economic Literature](#)', Melbourne Institute Working Paper No. 25/13

⁵ Jensen, P.H. and Webster, E. (2009), '[Another look at the relationship between innovation proxies](#)', Australian Economic Papers, vol. 48 (3), pp.252–269

⁶ The '[Textile, Clothing and Footwear Post-2005 Strategic Investment Program Scheme 2005](#)' defines innovation as Australian-based only if it occurs in Australia, section 1.5(c), p.9

application through to granting of IP rights. An important feature of the IPGOD is the ability to match IP administrative data with firm-level business characteristics for Australian companies.

The IPGOD includes geospatial data such as the state/territory and postcode of the applicant, and a geocode of the applicant address, as well as a marker indicating the quality of the geocoding. We used this data to identify Australian trade marks and designs.

In addition, trade marks and designs associated with patent applicants were analysed. Each applicant in the IPGOD is assigned a unique identifier across all the different intellectual property rights tables. For example, all of the patents, trade marks and designs owned by the Commonwealth Scientific and Industrial Research Organisation (CSIRO) have the same identifier. Thus we were able to identify patent applicants who also filed trade marks or designs in the TCF industry.

1.4 Time frame for analysis

Patents with a priority date between 1 January 2000 and 31 August 2012 were used in this analysis.⁷ PCT applications typically have an 18-month lag from filing to publication; as a result, PCTs published after August 2012 were not available at the time of extracting patent data for this report.

The priority date is the most relevant for ascertaining the date of invention. It is the earliest date recorded on patents and therefore allows the comparison of dates unaffected by administrative variations or delays.

Trade marks and designs with a filing date between 1 January 2000 and 31 December 2013 were analysed.

1.5 Classification of intellectual property rights

A combination of classification marks and keywords were used to define patents related to the TCF industry. Patent documents contain an IPC mark that classifies the invention(s) disclosed in the patent. The IPC classifies technology areas into 70 000 different codes. Whilst some of the IPC classifications have descriptions that readily correspond to TCF-related technologies, many do not. For this reason, keywords were also used to help define a patent set.

Trade marks were classified using the Nice Classification system, whilst we used the Australian designs classification (ADC) codes to classify designs. The ADC is substantially the same as the Locarno classification system used internationally. The ADC and Locarno systems can be used interchangeably as they share the common broad classes. The distinction between these two classifications occurs only in the lower subclasses in which the ADC has its own unique alphabetical codes.

The Nice and ADC systems are analogous to the IPC system for patents, in that they provide a means of grouping similar products, services and designs.

⁷ The Spring 2014 edition of the PATSTAT database used to identify PCT applications in this study contains all publications to the beginning of February 2014, essentially comprising publications with a priority date up to August 2012. Some documents with later priority dates are published less than 18 months from the priority date and are in the database.

1.6 Data extraction and analysis

There were four key stages of data extraction and analysis.

The first stage involved identifying the PCT, trade mark and design applications relating to the TCF industry, originating from Australia between 2000 and 2013. Patent, trade mark and design applications were identified in six phases (see Appendix A for a detailed methodology):

- Phase 1: We identified PCT applications, and their corresponding Australian NPEs, associated with TCF technologies, by IPC and keyword searches. Details of IPC and keywords searched are found in Appendix B and Appendix C.

The European Patent Office (EPO) worldwide patent statistical database (PATSTAT) and REGPAT⁸ produced jointly by the OECD and the EPO, were used to identify Australian-originating PCT applications.

- Phase 2: The bibliographic and firm-level information associated with the Australian NPEs identified in Phase 1 was retrieved. The patent families of the PCT applications were then established.
- Phase 3: We identified trade mark applications by searching relevant Nice Classifications. See Appendix D for details of Nice Classifications searched.
- Phase 4: Trade mark applications associated with patent applicants in Phases 1 and 2 were identified.
- Phase 5: We identified design applications by searching the Australian designs classification (ADC). See Appendix E for ADC codes searched.
- Phase 6: Design applications associated with patent applicants identified in Phases 1 and 2 were identified.

The second stage was data cleansing, such as eliminating duplicate records, identifying subsidiaries of parent companies, screening for spelling variation, and checking for genuine Australian-originating inventions.

The third stage was classifying data and eliminating irrelevant records.

The final stage comprised data analysis, including the calculation and visual presentation of patent metrics.

⁸ Maraut, S. et al. (2008), '[The OECD REGPAT Database: A Presentation](http://dx.doi.org/10.1787/241437144144)', OECD Science, Technology and Industry Working Papers, 2008/02, OECD Publishing, <http://dx.doi.org/10.1787/241437144144>

2 Patents

2.1 Overview of TCF patents filed by Australian applicants or inventors

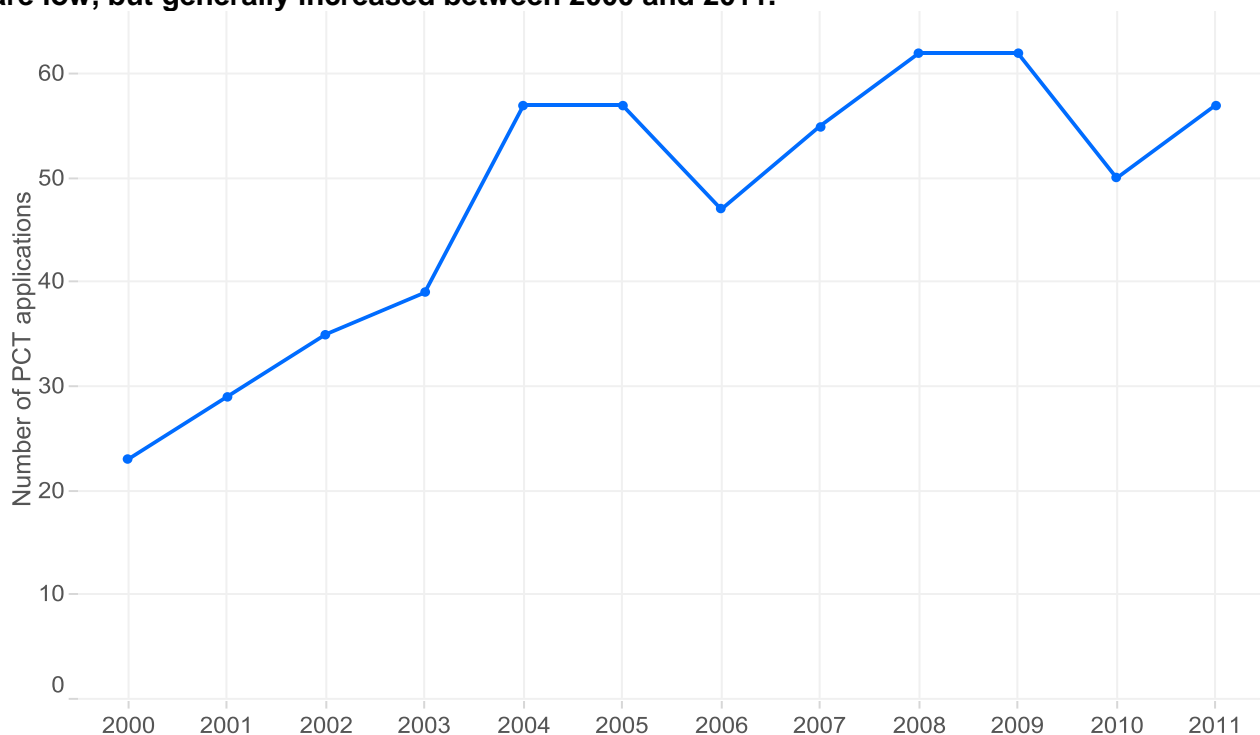
This study identified 590 PCT applications filed in the textiles, clothing and footwear industry worldwide with a priority date between 1 January 2000 and 31 August 2012, each of which had at least one Australian inventor or applicant. In contrast, 26 595 Australian PCT applications were filed across all technologies over the same time period.⁹ Textiles-related PCT applications therefore represent only 2.2 per cent of all Australian PCT applications filed during the study period.

2.1.1 Patent activity over time

The number of PCT applications filed in the TCF industry by Australian inventors or applicants, based on the earliest priority year, is shown in Figure 1. Annual applications increased between 2000 and 2004, and generally remained steady afterwards. By comparison, Australian PCT applications across all technologies peaked in 2005-06, with a steady 2000 applications per year from 2000-02 and 2008-11.¹⁰

The small dip in textiles-related applications during 2009-2010 may indicate that innovation in the TCF industry was not greatly affected by the global financial crisis of 2007-08, changes in TCF tariff levels, the strengthening of the Australian dollar after 2009, or the free-trade environment beyond 2010. The database was current to 31 August 2012, and there were 17 Australian PCT applications in the TCF industry for that portion of the year. Given the incomplete data for 2012, we have excluded 2012 from the figure.

Figure 1: Australian PCT applications by priority year. The overall numbers of applications are low, but generally increased between 2000 and 2011.



Source: PATSTAT, Spring 2014

⁹ Source: IP Australia calculations using PATSTAT, Spring 2014

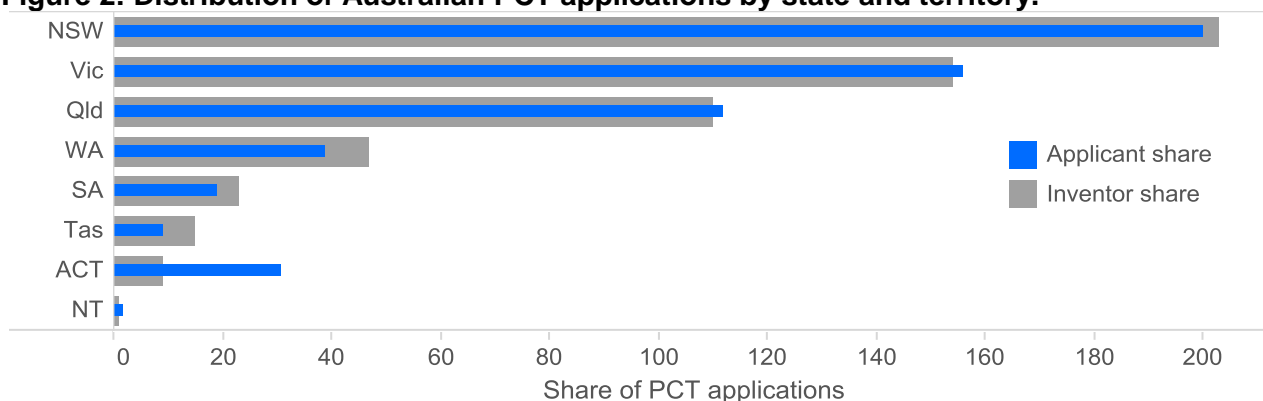
¹⁰ Ibid

2.1.2 Patent activity by location

The distribution of TCF-related inventions by Australian state and territory is shown in Figure 2. Co-inventorship and co-ownership—meaning inventors from multiple states, territories or countries—are accounted for by calculating inventor and applicant shares.¹¹

For example, if one PCT application has four inventors and two applicants, each inventor is assigned an ‘inventor share’ of 0.25 for that application, and each applicant receives an ‘applicant share’ of 0.5. The values in Figure 2 represent the sum of the inventor shares and applicant shares for each state and territory.

Figure 2: Distribution of Australian PCT applications by state and territory.



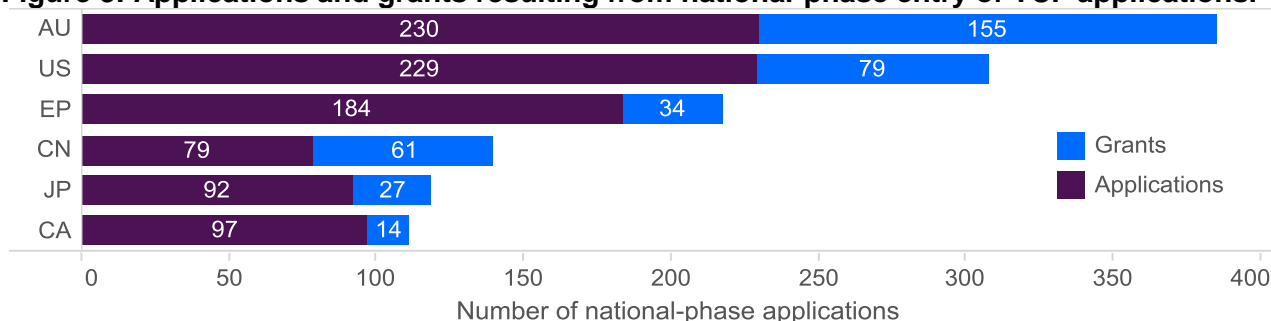
Source: OECD, REGPAT database, July 2014

As indicated in Figure 2, the majority of inventors and applicants in this study originated from New South Wales, with about 200 applications based on inventor or applicant share, followed by Victoria (about 150) and Queensland (about 110). A slight difference in numbers between inventor shares and applicant shares indicates interstate and international collaboration between inventors and between applicants. The applicant share for the ACT is greater than the inventor share because CSIRO headquarters are located in Canberra, while the CSIRO-affiliated inventors identified in this study reside in Victoria.

2.1.3 Target markets

National-phase entries related to the 590 PCT applications were investigated for Australia, the United States, the European Union, China, Japan and Canada. The number of applications and granted patents resulting from prosecution of national-phase applications in these jurisdictions is shown in Figure 3. The majority of applicants progressing to national-phase entry (NPE) chose to prosecute their inventions in Australia, followed by the United States.

Figure 3: Applications and grants resulting from national-phase entry of TCF applications.



¹¹ The REGPAT database contains classification codes corresponding with AU states and territories that were derived from the recorded inventor and applicant addresses associated with the PCT application. See OECD (2010), ‘[Measuring Innovation: a New Perspective](#)’, p.34

Source: PATSTAT, Spring 2014

From the 590 PCT applications, there were 385 NPE applications in Australia. This difference is a result of not all PCTs entering national phase, and of others filing multiple patents from a single PCT application. In addition, national-phase applications may include divisional applications and other types of continuing applications. During the period of this study there were only a small number (155) of granted patents in Australia relating to the TCF industry.

2.2 Patent applicants

This study identified 541 applicants associated with PCT applications in the TCF industry, which includes co-applicants. Only 62 of the 541 applicants in this study, or 11 per cent of applicants, filed two or more PCT applications. Therefore, 89 per cent of applicants filed just one PCT application—a very high proportion compared to other industries in the same time period.¹²

2.2.1 Key applicants

Applicants for TCF-related patents include individuals, foreign corporations, large Australian companies, and research organisations such as universities and the CSIRO. In Table 1, we link applicants with the size of their business using the IPGOD tables.¹³ The patent dataset in IPGOD contains information on applications by Australian applicants, where those applications have entered national phase. This means that the data represented in Table 1 do not include PCT applications that did not enter national phase in Australia. Furthermore, detailed firm-level data is only available for Australian applicants. We were able to match business-size details for 334 of the 341 Australian applicants and their 355 applications. Note that some national-phase applications had applicants in more than one category. Half of the applicants were individuals who filed privately or who appear as co-applicants on a PCT application and in the corresponding national-phase application, as shown in Table 1.

Table 1: PCT applications by firm type.

Applicant category	Number of applicants	Number of applications	Percentage of applications (%)
SME	157	186	51.4
Individual	147	125	34.5
Large corporation	21	26	7.2
Research	9	25	6.9

Source: IPGOD, 2014 edition

Research organisations identified in this study comprised the CSIRO and eight universities: Deakin University, James Cook University, University of Melbourne, University of New South Wales (NewSouth Innovations), Royal Melbourne Institute of Technology, University of South Australia, University of Western Australia and University of Wollongong.

Large firms with an Australian address included Hunger Douglas (see Box 4), Pacific Brands Clothing (see Box 9), Ansell and ResMed.

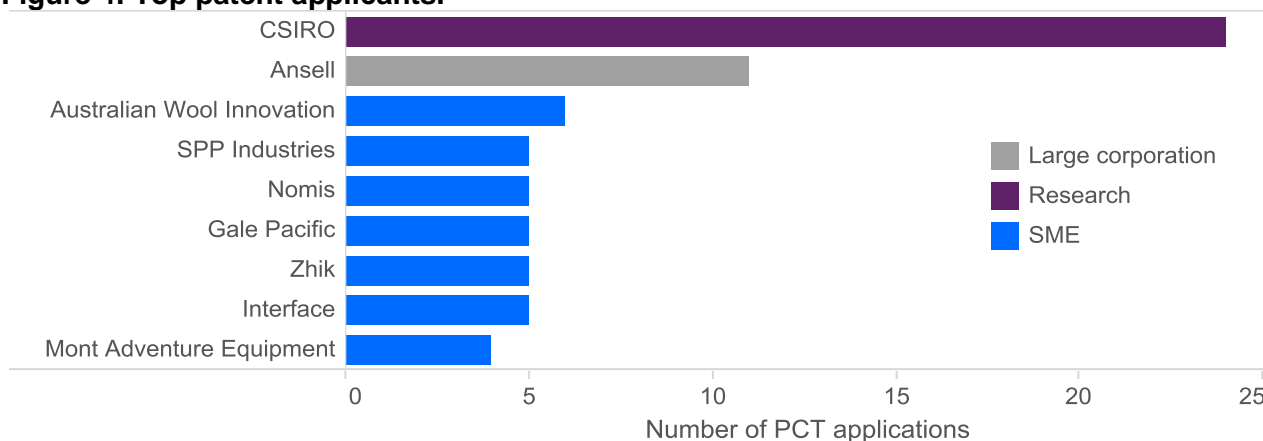
Applicants with at least four inventions filed in Australia are shown in Figure 4. Together, these entities are associated with 70 of the 590 PCT applications in this study, or approximately 12 per cent of Australian TCF patents.

¹² See, for example, IP Australia (2014), '[The Australian food industry: a patent analytics report](#)' or IP Australia (2014), '[Australian Medical Devices: A Patent Analytics Report](#)'

¹³ See Man, Bradley (2014), '[Overview of the Intellectual Property Government Open Data](#)'. IP Australia Economic Research Paper 02

The most prolific applicant is the CSIRO with 24 applications, followed by Ansell with 11 applications. CSIRO applications relate to high-technology textiles such as manufacturing nanofibre yarns, electroconductive textiles or new absorbent materials (Box 1). Ansell is based in Richmond, Victoria; its TCF inventions are primarily directed to knitted gloves with enhanced grip, durability or protective properties.

Figure 4: Top patent applicants.



Source: PATSTAT, Spring 2014 and OECD, REGPAT database, July 2014

Australian Wool Innovation (AWI), based in Sydney, is a not-for-profit company established in 2001 by the Federal Government; it invests in research and development for the benefit of Australian woolgrowers. The Woolmark Company Pty Ltd, owner of the Woolmark logo, is a subsidiary of AWI.¹⁴

SPP Industries is a Brisbane-based company combining engineering and manufacturing expertise to improve a range of products including drapery hardware, blinds and shades.

Nomis Sports Innovations, based in Brisbane, invented customised, grip-enhanced football boots.

Gale Pacific is a Victorian company focusing on woven, polymeric fabrics for screening and shading products for domestic, commercial and industrial applications including the Coolaroo brand of gazebos, shade sails and flyscreens.

Sydney-based manufacturer Zhik produces performance garments for professional athletes involved in water sports, especially sailing, and commercialises its innovations through R&D efforts involving the athletes. Zhik products are sold in more than 40 countries.¹⁵

Interface is a Sydney-based company manufacturing carpet tiles and laminated floor coverings.

Canberra-based company Mont Adventure Equipment is a manufacturer of premium outdoor equipment such as clothing, packs, tents and sleeping bags. Mont also develops high-quality uniforms and gear for corporate, industrial, government and defence customers.

¹⁴ See [AWI's history](#)

¹⁵ See [About Zhik](#)

Box 1: Kimberly-Clark, Textor Technologies and the CSIRO



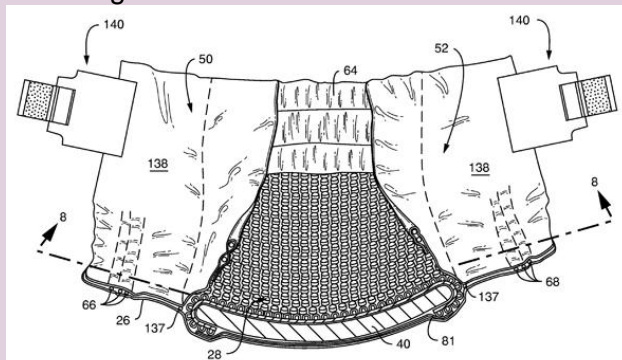
Collaboration between multi-national personal care giant Kimberly-Clark, family-owned Victorian manufacturer Textor Technologies and the CSIRO has resulted in an innovative super-absorbent, three-dimensional material for nappies called 3D UltraAbsorb® (trade mark 1510737). The product has been sold in newborn- and infant-size Huggies® (trade mark 307608) nappies since March 2013.¹⁶ Since 2014, larger-sized Huggies® nappies have included another Textor and CSIRO

innovation, the 3D DryTouch® (trade mark 1595499) layer.

Textor, based near Melbourne's Tullamarine airport, engineers non-woven textiles for the hygiene, health care, automotive, filtration, food packaging, environment and general technical fabrics markets. The company is a big supplier to Kimberly-Clark.

Through Enterprise Connect's Researchers in Business program, a CSIRO physicist was embedded in operations at Textor in 2010, conducting R&D in non-woven textiles used for hygiene and wound-care products.^{17,18}

The 3D UltraAbsorb® innovation spawned five PCT applications, which were filed too late to be within the scope of this study and therefore were not counted in CSIRO's 24 PCT applications reported on in section 2.2.1. These PCT applications were all directed to an absorbent article (WO 2014/068487, WO 2014/068488, WO 2014/068489, WO 2014/068490 and WO 2014/070829).



Source: WO 2014/070829

¹⁶ ['Australian innovation to revolutionise nappy market'](#), Kimberly-Clark, 12 March 2013

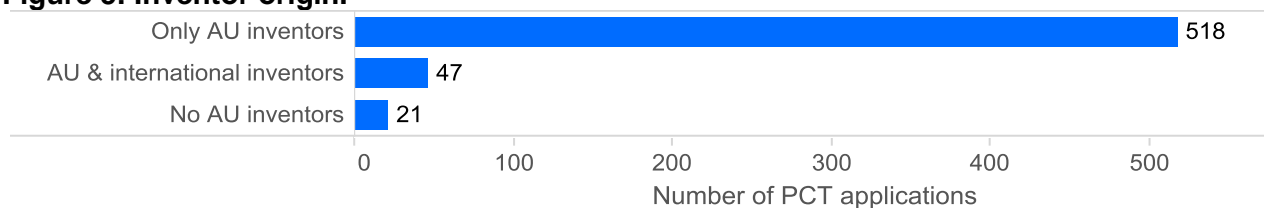
¹⁷ ['DIISR Researchers in Business: Making hygiene products more comfortable'](#), CSIRO, May 2011

¹⁸ ['Textor, Kimberly-Clark and CSIRO cooperation led to new product'](#), Manufacturers' Monthly, 20 March 2013

2.2.2 Level of domestic and international collaboration

Of the 590 PCT applications identified in this study, 518 of them (88 per cent) listed only inventors with Australian addresses (Figure 5), which overwhelmingly indicates that the inventive activity for these Australian TCF inventions took place domestically. Only 47 applications involved a collaboration between Australian and overseas inventors. Another 21 applications had at least one Australian applicant, but only international inventors.

Figure 5: Inventor origin.



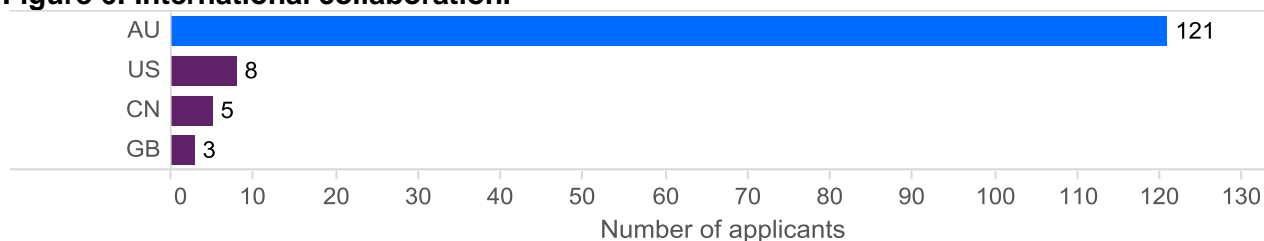
Source: PATSTAT, Spring 2014 and OECD, REGPAT database, July 2014

Moreover, of the 869 unique inventors identified in this study, 162 were the sole applicant for their respective inventions. That is, for 19 per cent of the PCT inventions identified in this study, the applicant was also listed as the inventor.

2.2.3 Collaboration between applicants

The presence of multiple applicants on a patent application may be used as a proxy indicator for collaboration. The top countries collaborating with Australia in the TCF industry, as measured by Australian PCT applications listing more than one applicant, are shown in Figure 6. Note that only 11 per cent of the 590 PCT applications identified in this study included multiple applicants. Within this subset of 65 applications, there were 145 applicants from 20 countries. Figure 6 shows that 121 Australian applicants collaborated only with one another. Applicants from the United States, China and Great Britain only accounted for 16 applicants combined.

Figure 6: International collaboration.

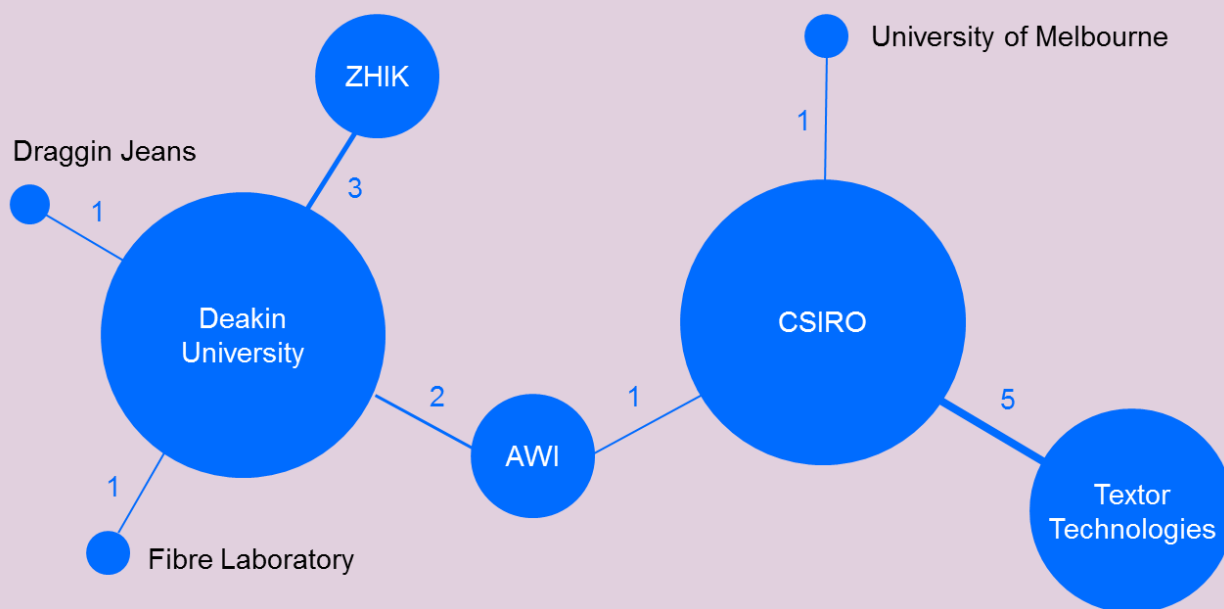


Source: PATSTAT, Spring 2014 and OECD, REGPAT database, July 2014

Box 2: Knowledge transfer between industry and PFROs

The Australian TCF industry has benefitted from State and Federal Government-funded programs linking industry and publicly funded research organisations (PFROs) such as the CSIRO and Deakin University. The matrix below reveals a snapshot of collaborations identified through our dataset, many of which were funded through AusIndustry grants or Enterprise Connect's 'Researchers in Business' program. The diameter of each circle and the thickness of the connecting lines scale with the number of co-applications between these entities, as indicated along each line.

Deakin University researchers have worked with SMEs Fibre Laboratory, Zhik, Australian Wool Innovation (AWI) and Draggin Jeans on a total of seven patent applications. All are represented in our PCT dataset except the Draggin Jeans application, which was only filed in September 2014. AWI also has one PCT application with the CSIRO (WO 2004/099490). In addition, CSIRO researchers worked with University of Melbourne veterinarians on a girth strap device for securely holding a saddle to a horse (WO 03/022730), and with Kimberly-Clark Worldwide and Textor Technologies on five PCT applications (see Box 1).

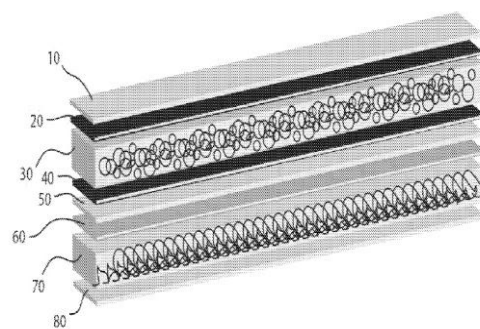


2.3 Types of patents originating from Australia

We developed a technology sector breakdown for TCF-related PCT applications, based upon industry sectors identified in the Department of Industry and Science's 'Textiles, Clothing and Footwear (TCF) Industry Capability Map: Textiles' and associated Carpet, Footwear and Leather Capability Maps (Figure 8). Because an invention may straddle multiple technology sectors, we calculated technology shares for each category in each PCT application.

For example, the invention described in WO 2011/063472 relates to a waterproof, breathable, stretchable composite material for garments, in which a series of layers manage thermal and moisture transfer properties (Figure 7). This PCT application is given a 'technology share' of one-third in three categories: advanced manufacturing, protective and sport.

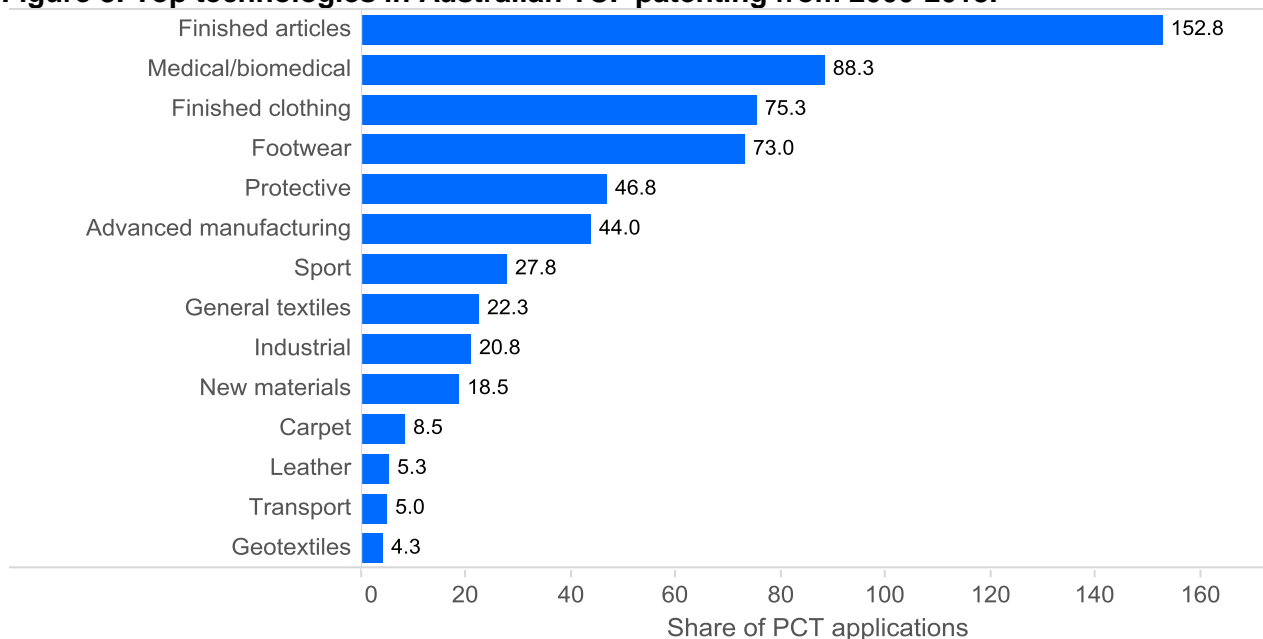
Figure 7: This composite material is an example of an invention that straddles multiple technology sectors.



Source: WO 2011/063472

Most categories are self-explanatory and are listed in Appendix F. However, the furnishing and apparel fabrics sector is separated into ‘finished clothing’ and ‘finished articles’—encompassing ready-to-wear clothing and home wares, for instance. ‘General textiles’ is a category directed to the weaving or manufacturing methods for filaments, fibres and fabrics themselves.

Figure 8: Top technologies in Australian TCF patenting from 2000-2013.



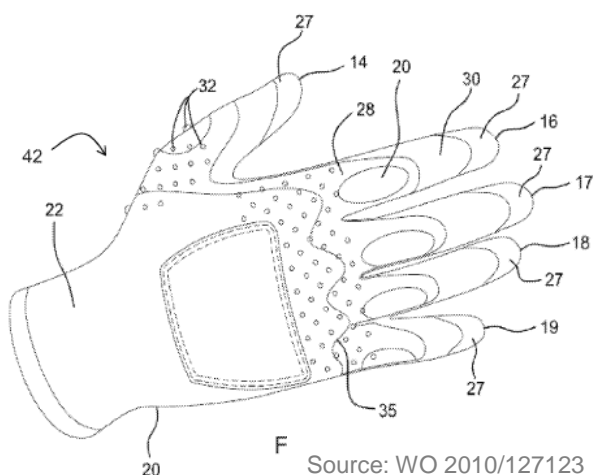
Source: IP Australia calculations

Figure 8 shows that finished articles, medical and biomedical textiles, finished clothing and footwear dominate inventive activity in the industry. Because most textile-related inventions ultimately relate to a finished article or finished items of clothing, we categorised inventions according to their primary or secondary purpose wherever possible. For example, an absorbent article such as a baby’s nappy falls within medical/biomedical textiles rather than being categorised as a finished article or finished clothing.

We will explore the nature of selected technology categories in the following sections.

2.3.1 Finished articles and finished clothing

Figure 9: Knitted gloves having a continuous single layer with a plurality of yarns knitted together.



Source: WO 2010/127123

Finished articles and finished clothing includes home furnishings such as bedding and blinds, headwear like hats and helmets, accessories such as bags and gloves, and garments like underwear or nursing-wear.

Given the inclusion of gloves in the finished clothing category, it is not surprising that Ansell is the top applicant, with six applications relating to knitted gloves; many of these gloves include coatings or reinforcements for protection against sharp materials and are thus additionally classified in the protective category.

For instance, some embodiments of WO 2010/127123 (Figure 9) are directed to protective knitted gloves and liners comprising a number of different yarns knitted together in a single layer, which are suitable for use by tradespeople such as carpenters or electricians.

The top applicant in the finished articles category, SPP Industries Holdings Pty Ltd, filed PCT applications relating to improvements in blinds, especially Roman blinds. Other prominent applicants in the finished articles and finished clothing categories include bedding manufacturers Intide Pty Ltd and A. H. Beard Pty Ltd, Pacific Brands Clothing, outdoor equipment manufacturer Mont Adventure Equipment Pty Ltd and a Sydney-based sole trader innovating in the field of self-retracting rolling blinds and awnings.

2.3.2 Medical and biomedical textiles

Medical and biomedical textiles comprise absorbent articles such as nappies and incontinence pants, bandages and patches, braces and supports, and high-tech therapeutic fabrics.

Top applicants innovating in absorbent articles include Fred Bergman Healthcare Pty Ltd, Kimberly-Clark Worldwide, Inc. and SCA Hygiene Products, each with three applications over three years in our dataset.

Cure Therapeutics, Inc., based in New York City, worked with the Orthopaedic Research Institute at the University of New South Wales to develop nitroglycerin-containing transdermal patches for the treatment of damaged musculoskeletal tissue (WO 2007/100910, WO 2007/103190 and WO 2008/027203).

Wollongong-based medical design company GuardaHeel invented a foam, rubber and/or gel device to elevate a patient's heel and ankle in the operating theatre, to prevent the formation of pressure ulcers and deep vein thrombosis (WO 2010/139024, see Figure 10).

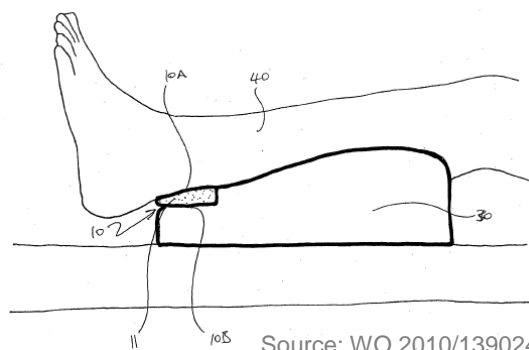
Three 2008 PCT applications from Saluda Medical, a spin-out company of National ICT Australia, pertain to knitted electrode assemblies for implantable medical devices (WO 2010/033368, WO 2010/033369 and WO 2010/033370). There are 10 PCT applications in high-tech therapeutic fabrics, in diverse areas including antibacterial or antimicrobial fabric materials, monitoring sensors or flexible electronic devices incorporated in clothing or mattress mats, and a dressing containing a matrix of composite sensor fibres.

2.3.3 Sport and footwear

We have grouped the sport and footwear technology categories together because applicants in one of these TCF sectors tend to also be in the other sector. The top three applicants in the sport category are the CSIRO, with three applications relating to multilayered wicking fabrics for sports garments; Nomis, with four applications directed to improvements relating to sports shoes; and water-sports garment manufacturer Zhik (Figure 7) with three applications.

A Deakin University researcher is a co-applicant on two of Zhik's applications (WO 2012/073095 and WO 2012/073096) with Zhik receiving over \$100 000 from the Federal Government's Enterprise Connect programs 'to develop and review new materials and concepts for fabrics and garments'.¹⁹ Both relate to layered materials with various combinations of heat-retaining, heat-reflecting, moisture-wicking or waterproof properties (Figure 11).

Figure 10: GuardaHeel elevation device for prevention of heel and ankle ulcers.



¹⁹ See Department of Industry and Science, '[Grants: January to March 2011](#)' and '[Grants: July to September 2012](#)'

Figure 11: Composite heat-retention fabric developed by Zhik with Deakin University.



Source: WO 2012/073096

Nomis has the highest number of PCT applications in footwear technology, with five applications over four years, relating to football boots and the grip or self-cleaning properties of their outsoles. The top applicant is dancewear company Pointe Noir Pty Ltd. Pointe Noir and related firm Bloch Pty Ltd have three applications, relating to flexible or protective footwear for ballet and modern dance. In 2010, dancewear company Muse Dancewear of Hawthorn, Victoria, filed two PCT applications for improved dance shoes.

2.3.4 Advanced manufacturing and new materials

There is some overlap between the advanced manufacturing and new materials sectors of the TCF industry, with 21 applicants filing only in one or both of these technologies. For example, AWI has six applications, all of which were filed in these two technology sectors. AWI collaborated with The Hong Kong Polytechnic University on a light-activated coating that triggers a self-cleaning process on a wool article (WO 2008/120088). They also collaborated with Deakin University on a natural fibre coated with an electrically conductive polymer (WO 2006/081622) and on the production of a semi-synthetic material including a modified ultra-fine natural fibre powder and a synthetic polymer component (WO 2008/086570, Figure 12).

Victorian company Fibre Laboratory Pty Ltd, formerly known as Fibrenova Ltd and associated with Textile & Composite Industries Pty Ltd, collaborated with Deakin University under a \$485 000 AusIndustry R&D grant,²⁰ inventing a degumming process that allows separated hemp fibres to be spun like cotton (WO 2003/006722). Fibre Laboratory later filed two PCT applications directed to an apparatus and method for processing plant material such as hemp, ramie or jute (WO 2004/088006 and WO 2006/094359). The former application was made in collaboration with Victorian SME Williames Pty Ltd (previously Williames Hi-Tech International), a manufacturer of agricultural and horticultural machinery.

The CSIRO dominates the advanced manufacturing and new materials technologies, with 20 PCT applications ranging from carbon nanotube yarns and garments incorporating sensors to increasing lint removal or fibre length during cotton ginning.

Figure 12: Dyed knitted polymer yarns with pure polypropylene filaments (left) and polypropylene containing 2 per cent of two different preparations of undyed modified wool powder (centre and right).

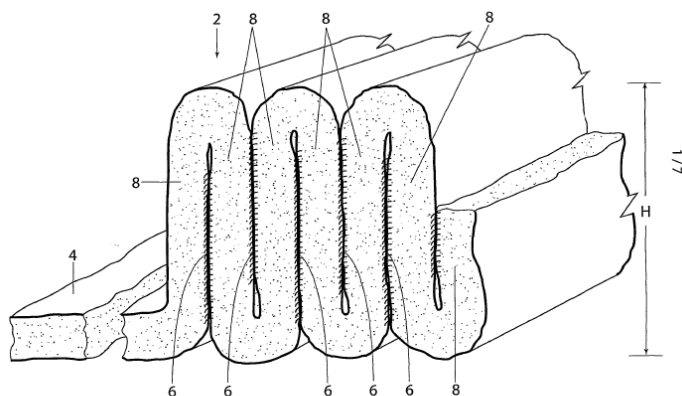


Source: WO 2008/086570

²⁰ AusIndustry (2001), 'Industry and Research Development Board Annual Report 2000–2001', see Table K4: R&D Start grant agreements signed (by company) 2000-01 on p.129

2.3.5 Protective and industrial textiles

Figure 13: Wave-shaped web of insulating material formed of waste material such as old newspapers or telephone directories combined with synthetic spring fibres such as PET.



Source: WO 2005/021884

Ansell Limited holds six PCT applications in protective technologies, all relating to protective gloves. The CSIRO is the next-highest applicant, with four PCT applications straddling the advanced manufacturing and industrial categories.

One of these applications (WO 2003/103815) was in collaboration with German viscose specialty fibre manufacturer Kelheim Fibres, relating to methods of reducing oxidation or shrinkage of polymers in fabric filters in high-temperature environments. This PCT application entered national phase in seven jurisdictions: China, the European Union, Japan, Korea, Mexico, South Africa and the United States of America, but not in Australia.

An applicant filing in both the industrial and protective categories is Dandenong-based

Enviromat Industries Pty Limited, who developed an alternative to fibreglass insulating material for thermal or acoustic insulation, involving a corrugated or wave-shaped web of fibrous material including cellulose fibres such as waste paper or cardboard, and spring fibres formed from plastics such as polyethylene terephthalate or PET (WO 2005/021884, Figure 13).

2.3.6 General textiles

General textiles applications cover the subsectors of textile manufacture, sewing and design, and printing of textiles. The top applicant is the CSIRO, with applications directed to machinery for carding textile fibres (WO 2001/092614); a process for mercerising unconstrained cellulosic fibres such as cotton, linen or viscose slivers (WO 2004/050979); and a textile combing apparatus which measures waste fibre output (WO 2005/001176).

Two Queensland innovators, both from The Sewing Revolution Pty Ltd, invented sewing aids and marking templates (WO 2003/004749, WO 2006/063384 and WO 2008/106713).

2.3.7 Carpet, geotextiles, leather and transport

The technology sectors of carpet, geotextiles, leather and transport together represent 31 distinct applications from 27 applicants in our dataset.

Interface Aust. Pty Limited from Picton, NSW, is the leading innovator in carpet manufacturing. Interface has four PCT applications, directed to methods of making or curing carpet and carpet tiles (WO 2009/059366, WO 2011/066619, WO 2012/135908 and WO 2012/135909).

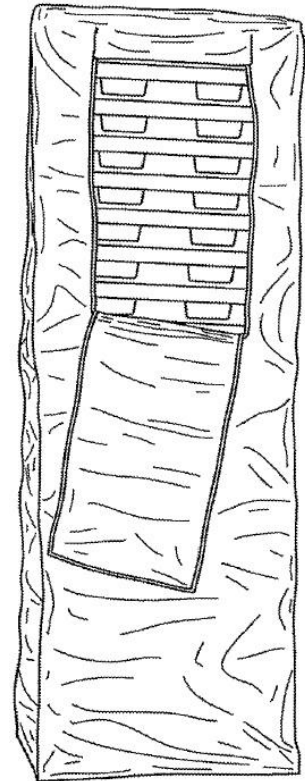
There are only five patents relating to geotextiles, all filed since 2007. Infrastructure Technologies Limited developed a channel and water-storage liner comprising a geotextile membrane and water impermeable cured cement-based composition, which combines the impermeability of plastic with the strength of concrete (WO 2010/124327). Geofabrics Australasia, formerly known as Elco Solutions Pty Ltd, invented a method of improving hydraulic performance of clay for application in geosynthetic clay liners or other barrier systems (WO 2009/023915).

In contrast, leather-related technologies exist in our dataset from 2000 to 2005, but have not appeared since then. The leather sector is represented by seven applicants and seven PCT applications, for identification, treatment and manufacture of hide into leather. Queensland-based Gibson Bass Hide Systems developed a hide-stamping apparatus (WO 2003/009979), which is in use at the Hastings Tannery in New Zealand.²¹

Transport applications within the TCF industry focus on vehicle covers, bags and containers for transportation purposes, and materials. For example, WO 2003/055728 assigned to Herd Bars and Bodies Pty Ltd, based in Kemblawarra NSW at that time, is directed to a reinforced woven material for belt webbing.

Airdex International Inc., based in Nevada in the United States, collaborated with South Australian company Technigraphica to develop lightweight, strong, fire-retardant bags for cargo and shipping purposes (WO 2007/095629 and WO 2007/092959, see Figure 14).

Figure 14: Lightweight, strong dunnage platform bag made of fire-retardant material.



Source: WO 2007/095269

²¹ The [Gibson Bass Stamper](#) permanently identifies and tracks the supply chain of individual hides and skins.

3 Trade marks

Trade marks are used to differentiate products and services of one trader from another. Trade mark filings have expanded rapidly in recent years with the total number of trade mark applications worldwide more than doubling between 1995 and 2013.²² Trade mark applications filed worldwide and in Australia have each grown consistently since 2009. Almost 63 000 trade mark applications were filed in Australia in 2013,²³ representing 1.2 per cent of the 4.87 million trade mark applications filed worldwide in the same year.

Whilst patents are proxies for innovation in high-technology industries, they are not necessarily associated with innovation in low-technology industries, or industries that have a high product turnover.²⁴ In these industries, such as clothing or furniture, trade marks may be relevant markers of innovation.

3.1 Overview of TCF trade marks filed by Australian applicants

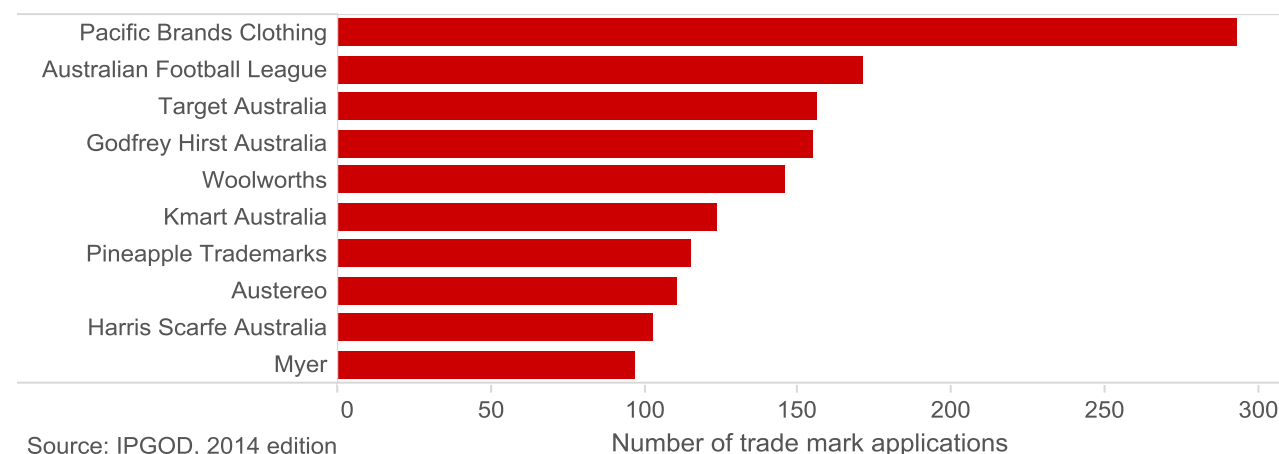
We identified a total of 66 515 unique trade mark applications associated with the TCF industry filed between 2000 and 2013. These applications are associated with 38 720 applicants (Table 2). SMEs (53.8 per cent) and individuals (38.5 per cent) who filed for trade marks made up the majority of trade mark applicants.²⁵ Whilst large corporations accounted for 1.8 per cent of the applicants, they accounted for almost 8 per cent of trade mark applications.

Table 2: Trade mark applications by firm type.

Applicant category	Number of applicants	Number of applications	Percentage of applications (%)
SME	15 478	36 252	53.8
Individual	22 543	25 936	38.5
Large corporation	699	5 142	7.7

Source: IPGOD, 2014 edition

Figure 15: Top 10 Australian trade mark applicants (excluding individuals). Most top applicants are not innovating in the TCF industry.



²² WIPO (2014), [World Intellectual Property Indicators – 2014 Edition](#), Economics & Statistics Series

²³ IP Australia (2015), '[Australian Intellectual Property Report 2015](#)', see Figure 9

²⁴ Jensen, P.H. and Webster, E. (2009) [Another look at the relationship between innovation proxies](#), Australian Economic Papers, vol. 48 (3), pp.252–269, September 2009

²⁵ This category is made up of individuals whose names are recorded in the IPGOD as 'non-entity' or 'sole traders' under the applicant clean name.

Figure 15 lists the top trade mark applicants, excluding individuals (for privacy reasons). Prominent TCF companies are included, such as Pacific Brands Clothing, which is the top applicant with 293 applications, and Godfrey Hirst, one of the top 10 carpet manufacturers in the world.²⁶ Also appearing among the top applicants are companies such as the Australian Football League (AFL), Woolworths and Austereo which are not related to textiles in the TCF industry. These companies appear because they are actively filing trade marks related to their brands on textile-related products such as shirts, jerseys or hats.

3.2 Trade mark applications by TCF patent applicants

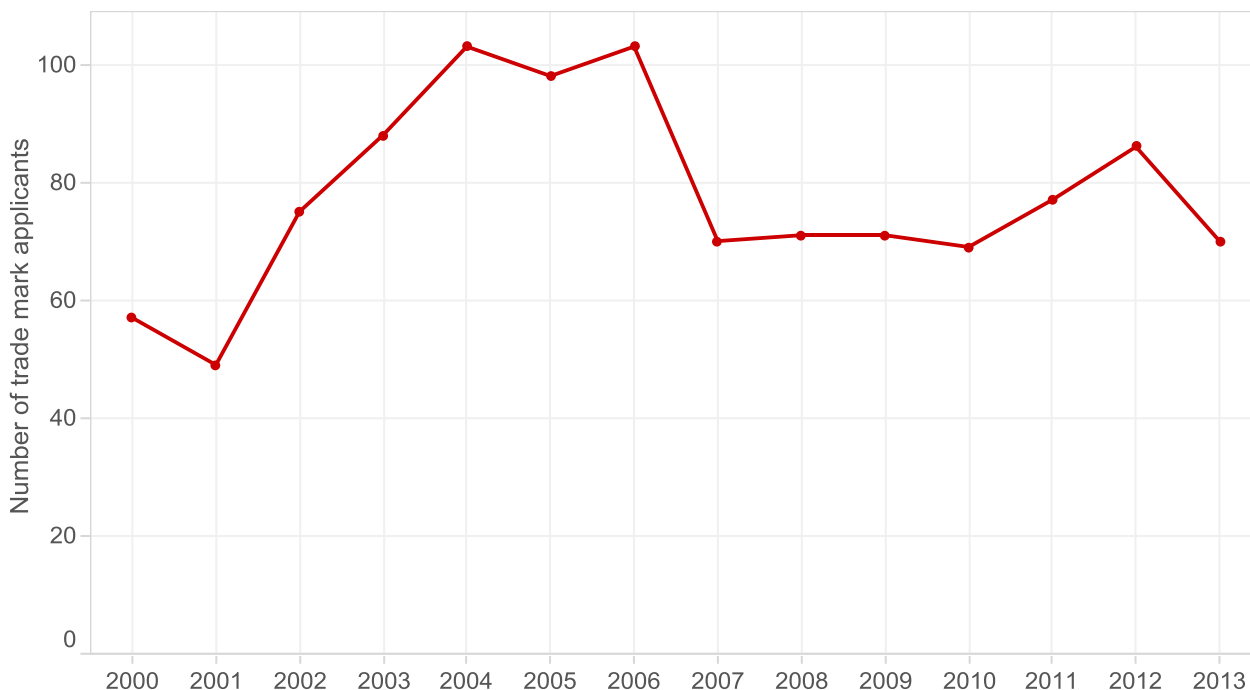
Whilst trade marks can be considered as markers of innovation, it is difficult to distinguish a trade mark for an innovative product from a trade mark for mere branding purposes. This is particularly true in the textiles industry, where a trade mark for a company name on a shirt will appear alongside a trade mark for a shirt woven from a new combination of fibres. Hence the presence of the AFL, Woolworths and Austereo amongst the top applicants in our broad trade mark search. To limit our dataset to those applicants providing technological innovation in the area, we further restricted our analysis of trade marks to those applicants who also filed at least one patent.

A total of 1087 trade mark applications filed by TCF patent applicants were filed in Australia over the period of 2000-2013. In other words, the applicants of these trade marks also have patents in their IP portfolio.

3.2.1 Trade mark activity over time

The number of trade mark applications filed by patent applicants, based on filing year, is shown in Figure 16. The number of applications per year remains steady over the period, apart from a spike in applications between 2001 and 2006. Given the low numbers of trade marks involved, this could easily be attributed to a small number of companies entering the Australian market.

Figure 16: Trade mark applications by filing year.



Source: IPGOD, 2014 edition

²⁶ See [About Godfrey Hirst](#).

3.2.2 Trade mark activity by location

Table 3 lists the number and percentage of trade mark applications filed by patent applicants, by applicant country. Of the 1087 trade mark applications from patent applicants, 837 were assigned to Australian applicants. The largest proportion of foreign applications came from New Zealand, and are all assigned to Bendon. There were also 66 applications from the United States, 59 of which are assigned to Kimberly-Clark (see Box 1); a further 48 applications were from LRC Products Limited in the United Kingdom. The 31 Swiss trade marks are all assigned to SKINS International.

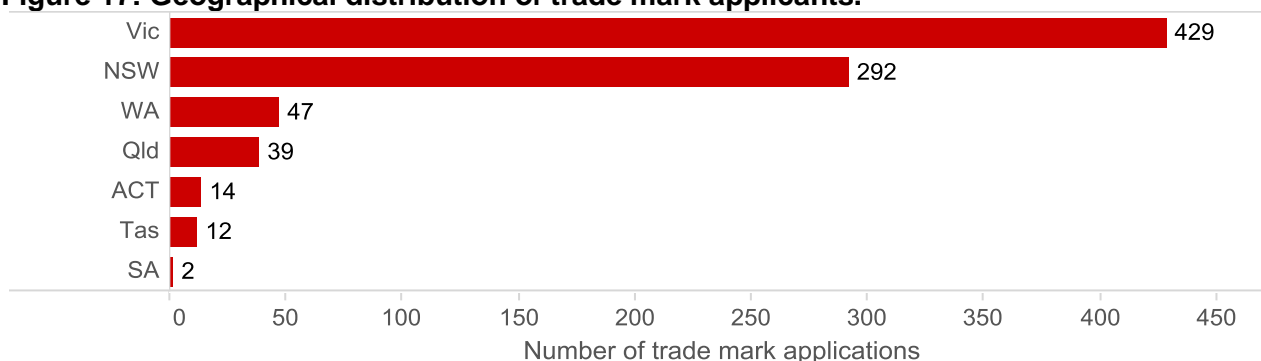
Table 3: Trade mark applications by applicant country.

Applicant country	Number of applications	Percentage of applications (%)
Australia	837	77.0
New Zealand	77	7.1
United States	66	6.1
Great Britain	48	4.4
Switzerland	31	2.9
Sweden	23	2.1

Source: IPGOD, 2014 edition

Of the 837 trade mark applications filed from Australia, the majority are filed from Victoria (429). This is largely due to Melbourne-based company Pacific Brands, who filed 293 applications. Pacific Brands accounts for 68 per cent of Victorian trade marks, and their trade mark portfolio is approximately equal to the number of trade mark applications filed in New South Wales (see Figure 17).

Figure 17: Geographical distribution of trade mark applicants.



Source: IPGOD, 2014 edition

Box 3: Melbourne Centre for Nanofabrication

One of the trade marks originating from Victoria was filed in 2009 by a consortium of the CSIRO and five Victorian universities: Monash University, the University of Melbourne, Swinburne University of Technology, La Trobe University and Deakin University. The acronym 'MCN' stands for the Melbourne Centre for Nanofabrication, located in Clayton. MCN's mission is to facilitate the integration of nanotechnology techniques into the R&D activities that support Australia's innovation and manufacturing economies.²⁷ One of its nanotechnology capabilities is in the area of 'characterisation'—an area of research into a material's structure and properties, which may have huge benefits in the area of protective clothing and footwear.

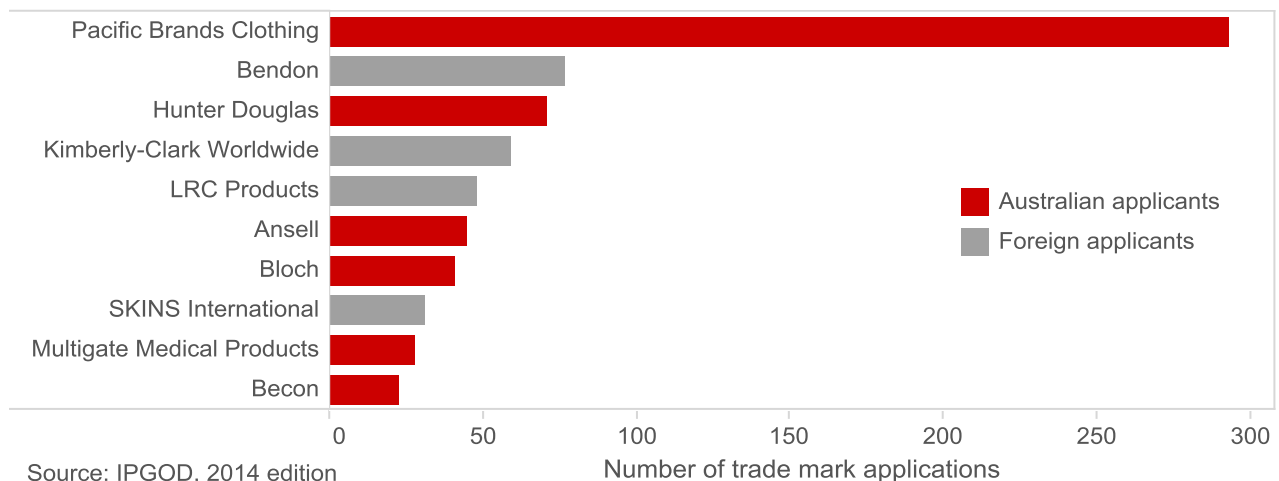


Source: Trade mark 1301745

3.2.3 Key applicants

Of the top 10 patent applicants who also file TCF trade marks, six are Australian applicants: Pacific Brands Clothing, Hunter Douglas, Ansell, Bloch, Multigate Medical Products and Becon (coloured red in Figure 18). The top foreign applicants include Bendon (New Zealand), Kimberly-Clark (US), LRC Products (GB) and SKINS International (Switzerland), who have at least one Australian inventor involved in their patent portfolio or are co-applicants on a patent with an Australian applicant. Pacific Brands, Kimberly-Clark Worldwide, Hunter Douglas and Ansell are large corporations; the remainder are SMEs.

Figure 18: Number of trade mark applications filed by top patent applicants.



Pacific Brands Clothing (Box 9) is the top TCF trade mark applicant (293 trade marks) that also has patents in its IP portfolio. Pacific Brands Clothing is a subsidiary of the parent company Pacific Brands Limited. Headquartered in Melbourne, the company filed trade marks on iconic Australian brands such as Bonds, Berlei and Stubbies. One of Pacific Brands' trade marks (trade mark 881987) is a well-known logo of 'BONDS' in white, capital letters with broken lines and black as a backdrop, used as a label in many of Pacific Brands' underwear and sleepwear garments.



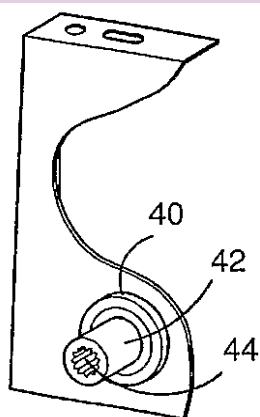
Source: Trade mark 881987

Bendon is a New Zealand-based lingerie and underwear SME who filed trade marks on brands such as Davenport (men's underwear) and Pleasure State (women's lingerie and loungewear).

²⁷ See the Melbourne Centre for Nanofabrication [MCN's vision](#) to be the pre-eminent site in Australia to solve problems using nanotechnology

Bendon filed 77 trade mark applications and was identified in the trade mark dataset from its association with a single patent application (WO 2007/140509) assigned to Bendon subsidiary Pleasure State Pty Limited. This patent application describes a range of enhanced push-up bras with different amounts of padding to enhance cleavage.

Bloch is the top NSW applicant with 41 trade mark applications. Bloch specialises in ballet shoes and costumes. Multigate Medical Products is another top NSW applicant, with 28 trade mark applications. Multigate specialises in design, manufacture and supply of surgical products.²⁸ Kimberly-Clark, a large US company whose textile products include feminine hygiene products and nappies, has 59 Australian trade mark applications. SKINS International Trading began an Australian company but is presently a foreign entity based in Switzerland (Box 8).



Source: WO 2009/100504

Box 4: Hunter Douglas Limited Australia

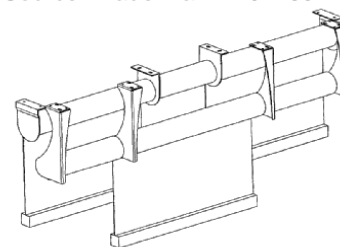
Hunter Douglas Australia has been specialising in the manufacturing of window coverings like blinds and awnings for over 60 years. Within the company, there is a textile division that develops and sources fabrics and yarns locally and worldwide. Manufactured fabrics include roller blinds, Roman shades, panel glide blinds, vertical blinds and fabric awnings.

Originally based in Germany, the company relocated to the United States in 1946, leading to the production of Venetian blinds. Hunter Douglas expanded to Australia in 1953, and remains based in Rydalmere, New South Wales.²⁹

The company filed 71 TCF-related trade mark applications and was

identified in the trade mark dataset because of a patent application (WO 2009/100504) filed by Designed Blinds Australia Pty Ltd, which is now part of the Hunter Douglas Australia brand Luxaflex® (trade mark 172612). The patent relates to a roller blind system and a special bracket to exclude light when two or more blinds span a glazed area. The brackets permit long installations in schools and hospitals, while also allowing an overlapped blind assembly that reduces light entry from a window or light source.

An example of a trade mark filed by Hunter Douglas is the 'MUSE' logo for window blinds, shades or awnings. Hunter Douglas also has three registered designs in our dataset. Design 200813267 relates to an overlap bracket system for roller blinds.



Source: Design 200813267

²⁸ Multigate Medical [Products](#)

²⁹ Hunter Douglas, [About us](#)

3.2.4 Trade mark activity by Nice Classification

Under Australian legislation, a single trade mark application may relate to goods or services in one or more of the 45 classes within the Nice Classification (NCL) system.³⁰

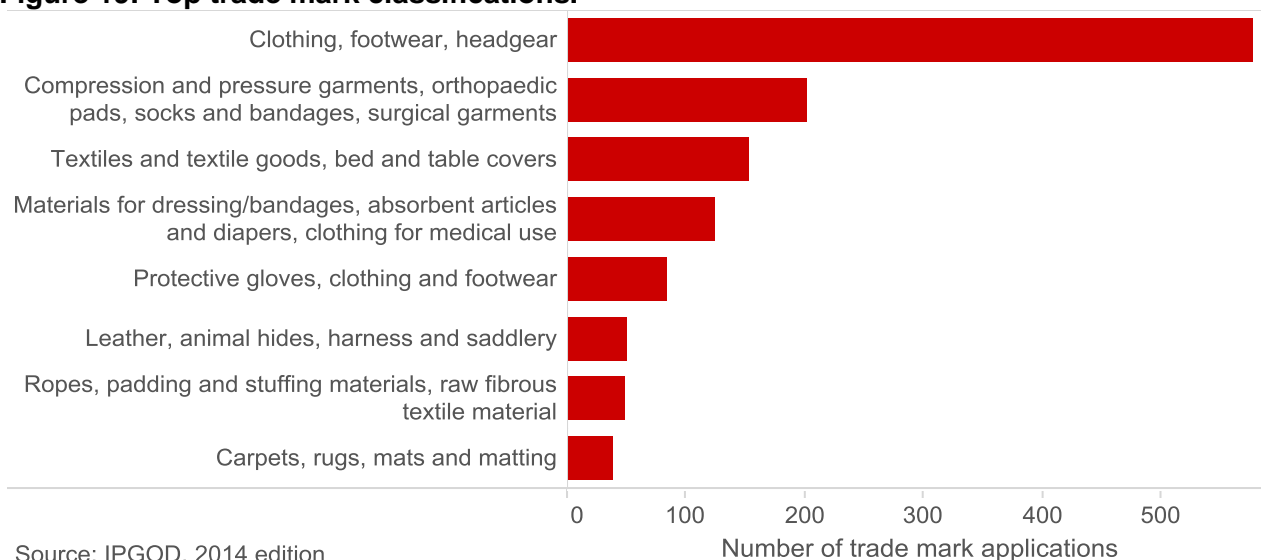
Figure 19 shows the top NCL descriptions for the 1087 trade mark applications in our dataset, where multi-class applications are counted multiple times. The majority of trade mark applications associated with TCF patents (44 per cent) relate to class 25 of the Nice Classification: clothing, footwear and headgear.

Most of the trade marks registered as clothing, footwear and headgear are registered by Pacific Brands Clothing, Bendon, Bloch and LRC Products.



An example of a trade mark registered by Bloch in the footwear class is the 'TMT' trade mark which is the acronym for thermo-morph technology. This logo is attached to Bloch's pointe shoes for ballet. Bloch uses the TMT paste, an advanced formula of heat-activated paste, in their pointe shoes. It enables the dancer to significantly accelerate the breaking-in process by moulding the shoe to the contours of the feet from the very first wear, providing comfort and durability.³¹

Figure 19: Top trade mark classifications.



SKINS International (Box 8) and LRC Products are top applicants in compression and pressure garments, orthopaedic pads, socks, bandages and surgical garments (class 10). Popular SKINS products include 'Snowskins' (trade mark 1106064) which contains the letter S in broken circle for the thermal cold gear compression garment used for extreme winter sports or the 'A400' (trade mark 1399287) for the compression sportswear range developed for athletes to enhance performance by delivering more oxygen in the blood flow to the active muscles and removing painful lactic acid. An example of a trade mark registered by LRC Products is Dr Scholl's (trade mark 224233) which is related to insole products to reduce the pressure of sport activities on feet.

Hunter Douglas (Box 4) is the top applicant in general textile goods (class 24), followed by Pacific Brands Clothing (Box 9) and AWI.

³⁰ IP Australia, [Apply for a trade mark: Classes of goods and services](#)

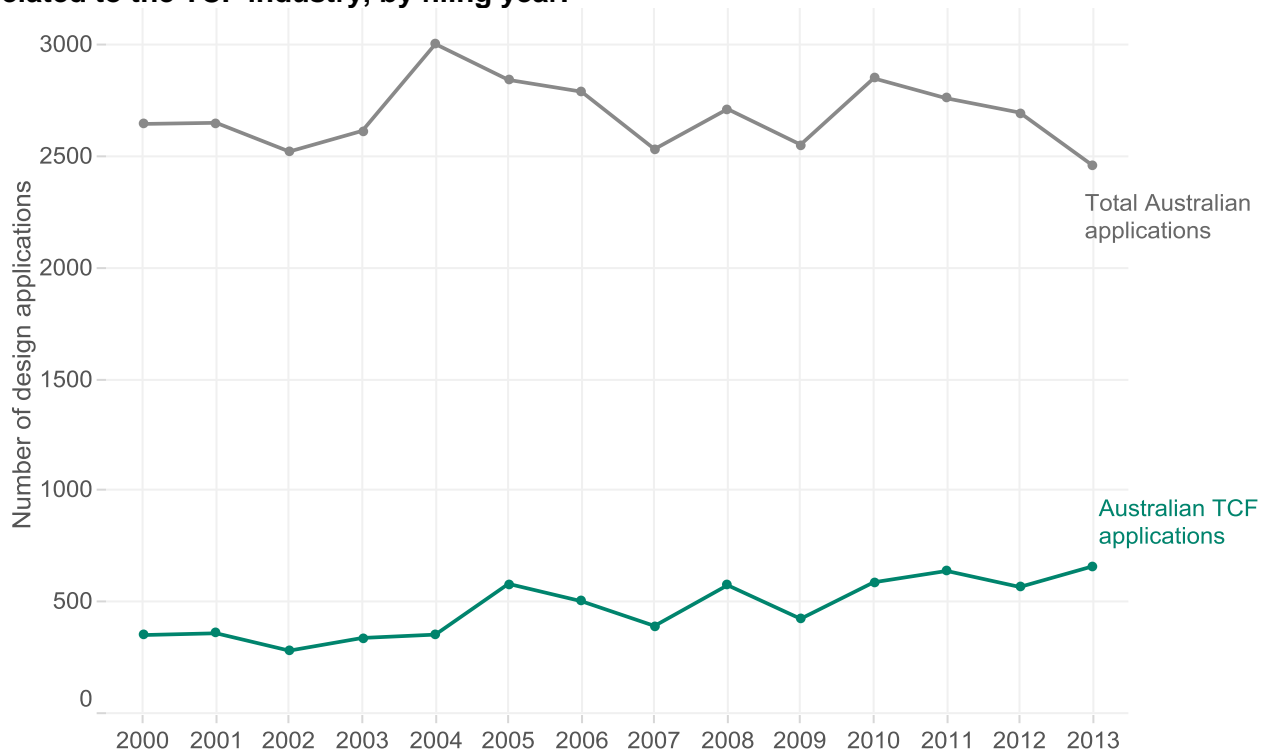
³¹ The Bloch [Axis pointe shoe](#)

4 Designs

4.1 Overview of TCF designs filed by Australian applicants

A total of 6611 textile design applications were filed by Australian applicants between 2000 and 2013, demonstrating that design filings are a major form of innovation for the TCF industry. Figure 20 shows the number of TCF design applications compared with the total number of Australian design applications filed in the period. Whilst the total number of design applications has trended down since 2010, the numbers of TCF design applications has remained steady.

Figure 20: Comparison of all designs applications filed by Australian applicants to those related to the TCF industry, by filing year.



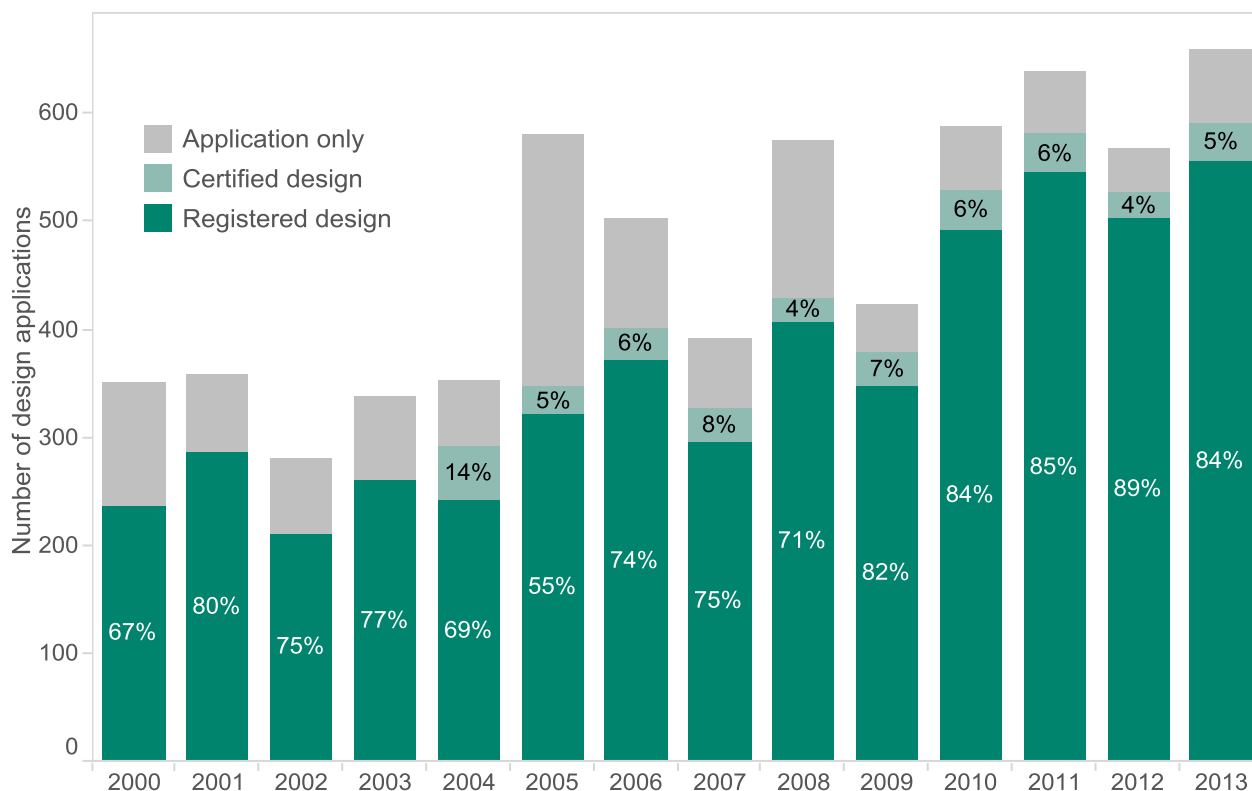
Source: IPGOD, 2014 edition

The number of design applications far outweighs the number of patent applications (see Figure 1), suggesting that design rights are an important form of IP for the TCF industry. Figure 21 shows the number of design applications, registrations and certifications over time. Since 2004 there has been an average of over 500 applications per year, and increasing levels of registration success. This is particularly true between 2010 and 2013, the years in which the most design applications were filed.

Certified designs only appear after 17 June 2004, when the *Designs Act 2003* (2003 Act) came into force. Under the previous *Designs Act 1906*, a design application was fully examined before being registered, and the owner of a registered design could bring an action for infringement. Under the 2003 Act, a registered design is only enforceable once it has been examined and certified.³² Most design applications do not proceed to certification.

³² Advisory Council on Intellectual Property (2013), '[Review of the Designs System: Issues Paper](#)', see Figure 1

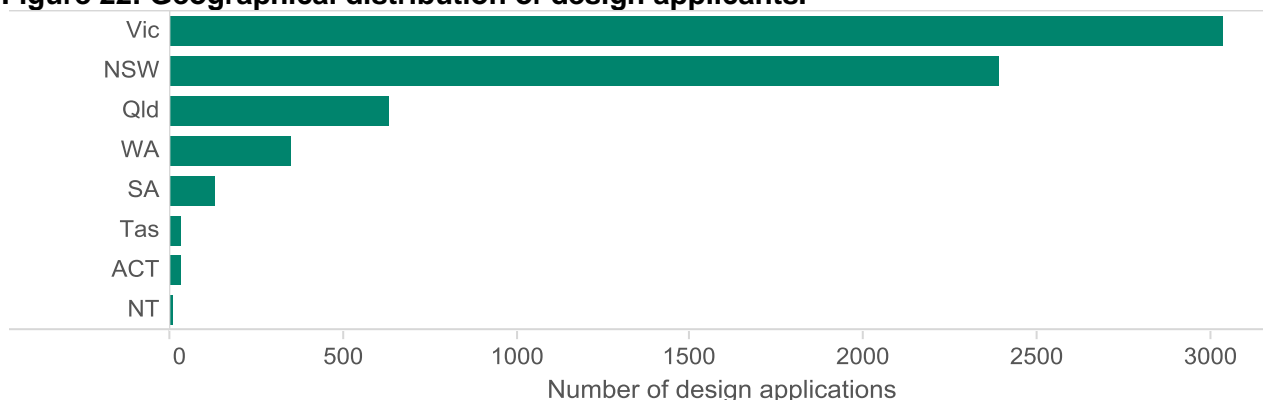
Figure 21: Designs applications and registrations, by filing year.



Source: IPGOD, 2014 edition

Figure 22 shows the distribution of design applicants by state or territory. Victorian applicants have filed the most design applications. This is in contrast with patents, in which New South Wales recorded the highest number of patent applications. The high number of design applications filed in Victoria is due to top applicants like Forever New being based there. Victoria is less dominant in design filings when compared to trade marks, as Pacific Brands does not have a large number of designs as part of its TCF-related IP portfolio.

Figure 22: Geographical distribution of design applicants.



Source: IPGOD, 2014 edition and IP Australia calculations

4.1.1 Key applicants

Sixty per cent of the 6611 textile design applications are assigned to SMEs, whilst individuals filed a third of applications and large corporations filed only 7 per cent (Table 4). This trend is similar across all rights in the TCF industry, with SMEs and individuals also making up the vast majority of patent and trade mark applicants.

Table 4: Design applications by firm type.

Applicant category	Number of applications	Percentage of applications (%)
SME	3990	60.2
Individual	2156	32.6
Large corporation	477	7.2

Source: IPGOD, 2014 edition

Box 5: Forever New Clothing

Forever New Clothing is a popular Australian fashion clothing and accessories brand founded in Melbourne, Australia. It is one of Australia’s fastest growing brands. It emerged in 2006 as a start-up retailer and now trades over 250 stores in nine countries globally. The company specialises in ladies’ clothing, shoes, bags and other fashion accessories like gloves, scarves and hats.³³

Forever New is the top Australian design applicant with 658 design applications. They have filed over 100 applications a year since 2010, culminating in 2013 with over 300 applications. In contrast, no other design applicant has filed more than 300 applications between 2000 and 2013. Forever New also has 18 trade mark applications in its IP portfolio.



Forever New’s designs include dresses, bags and fashion accessories. They are the top applicant in both the full body garment and upper-body garments classes, and have over a 20 per cent share of each class. Forever New also has 43 applications for handbags, representing over 15 per cent of the total handbag applications.

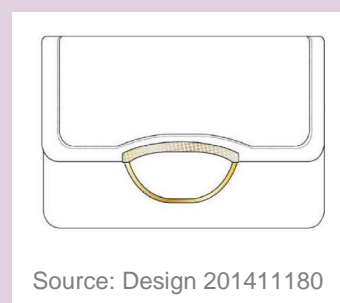
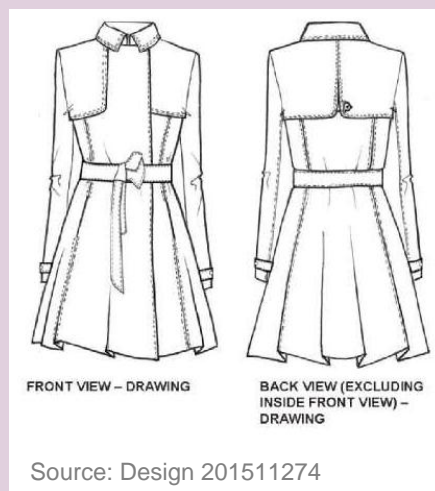
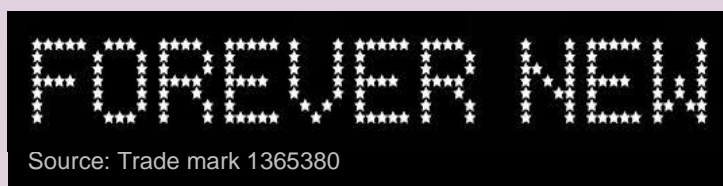
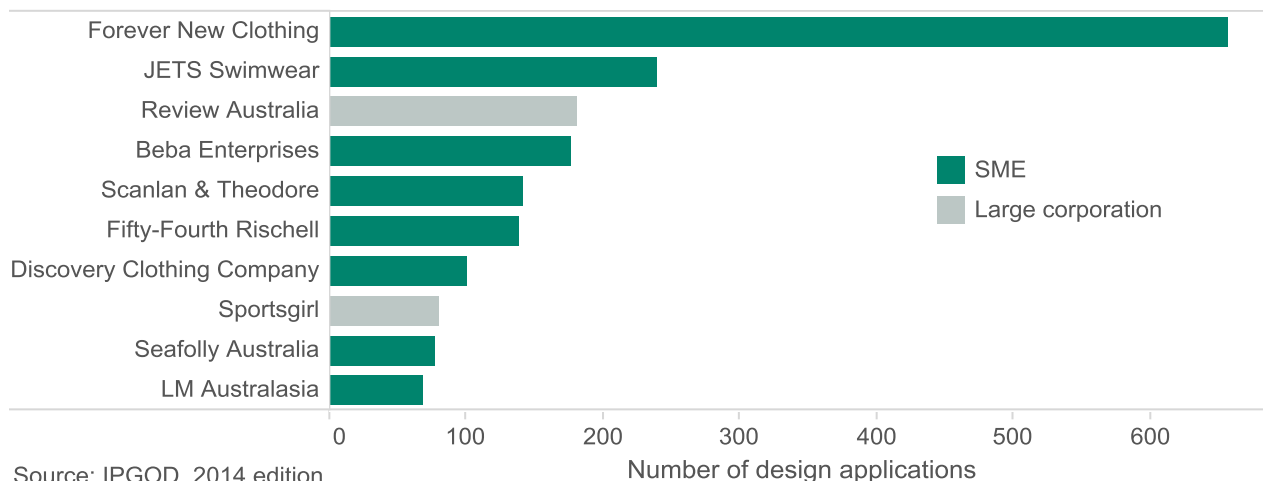


Figure 23 shows the top design applicants, excluding individuals. Most of the top 10 applicants are SMEs, the exceptions being Review Australia and Sportsgirl. In contrast, large corporations make up most of the top 10 applicants in trade marks (see Figure 15). Forever New Clothing is the top applicant with 658 applications (10 per cent, see Box 5), followed by JETS Swimwear (240, see Box 6) and Review Australia (181). Review Australia and Sportsgirl have not filed any design applications since 2008 and 2009, respectively, indicating that SMEs are currently the most active design applicants. Looking at the distribution by year, it appears as though applicants that filed

³³ Forever New, [About us](#)

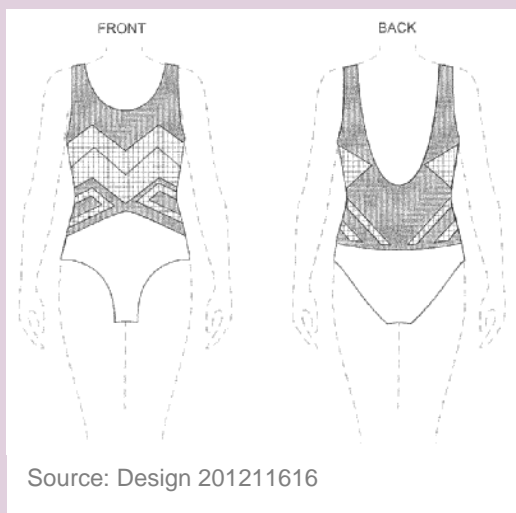
applications between 2004 and 2007 did not file further applications after 2009. There is a crossover in 2008-09 when applicants such as Review Australia, Scanlan & Theodore and Sportsgirl stopped filing design applications, and when applicants such as Forever New Clothing and LM Australasia (Box 7) began.

Figure 23: Top Australian design applicants.



Box 6: JETS Swimwear

JETS Swimwear is a Sydney-based company specialising in premium quality swimwear products. The JETS collection is designed for all consumers including labels such as the JETS White Label, JETS Kids as well as JETS Man ranges. The company initially designed bodysuits and expanded to other areas such as using stretch fabrics and subsequently swimwear products. Their swimwear designs are inspired by beautiful objects, fine fabrics and quality craftsmanship. The lead designer has fashion design and textiles qualifications from the University of Technology, Sydney and a post-graduate degree in tailoring from Milan.³⁴



JETS Swimwear has the second-highest number of design applications, after Forever New Clothing, with a total of 240 design applications (Figure 23). It has been filing design applications since 2006. JETS Swimwear files the most applications in the swimwear class (ADC 02-02A), having 231 applications in this class. JETS Swimwear has around a 65 per cent share of the total swimwear class (Figure 24). By comparison Seafolly Australia, the other swimwear company in the top 10 applicants, has only a third of the design applications that JETS Swimwear has in the swimwear class.

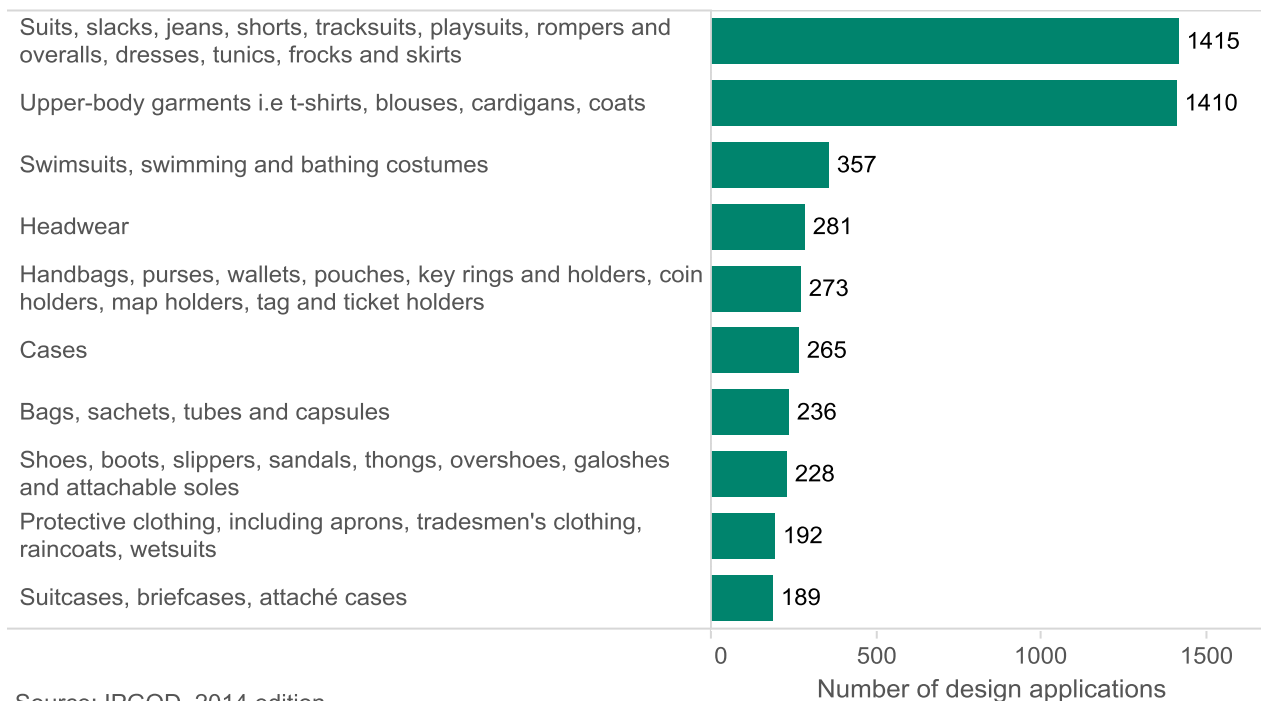
The JETS Swimwear registered design shown adjacent (Design number 201211616) features sequined panels represented by cross-hatched sections, and transparent mesh indicated in grey, which form the basis for the newness and distinctiveness of the garment.

³⁴ JETS Swimwear, [Design Philosophy](#)

4.1.2 Types of designs

The most common ADC classes for TCF industry design applications are suits, slacks, jeans, shorts, tracksuits, playsuits, rompers and overalls, dresses, tunics, frocks and skirts (ADC 02-02C) and upper-body garments (ADC 02-02Z), with over 1400 design applications each (Figure 24). This highlights that Australian designers file a large proportion of their design applications in everyday clothing categories in which there is likely to be high commercial interest. These two categories have seen a significant increase in filings since 2004.

Figure 24: Top designs classifications.



Box 7: LM Australasia

LM Australasia is the self-proclaimed no.1 seamless innovator in the world. They supply high-end fashion retailers across the globe, including department stores, national chains, mass merchants and specialty stores.³⁵

LM Australasia is in the top 10 applicants, with 68 design applications. Within this they have 28 applications in the suits, slacks, jeans, shorts, tracksuits, playsuits, rompers and overalls, dresses, tunics, frocks and skirts class and 27 in the upper-body garments class.

An example of one of their signature items is this sleeveless dress made with seamless construction and unique maze jacquard using contrasting yarn.



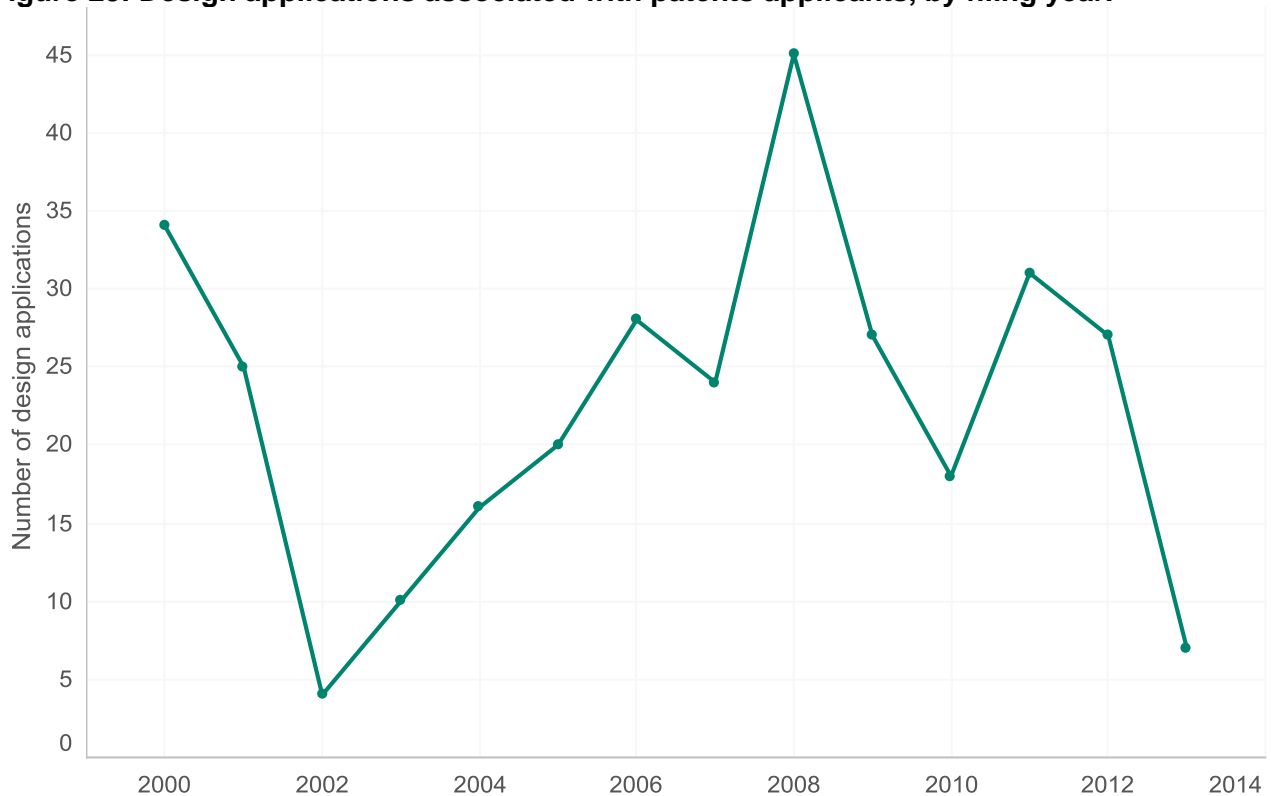
³⁵ LM Australasia, [About us](#)

4.2 Design applications by TCF patent applicants

4.2.1 Design activity over time

We investigated patent applicants who filed designs, as for trade marks. A total of 316 design applications were filed by patent applicants in the period 2000-2013, which is less than either patent or trade mark applications for the same period (Figure 25). This suggests that patent applicants in the TCF industry are not commonly using design rights as part of their IP strategy. In fact, 47 per cent (149 applications) were filed by two foreign companies—Kimberly-Clark Worldwide and SCA Hygiene Products.

Figure 25: Design applications associated with patents applicants, by filing year.



Source: IPGOD, 2014 edition

4.2.2 Design activity by location

Of the 316 designs filed by patent applicants, only 143 (about 45 per cent) were filed by Australian applicants (Table 5). This is in contrast to patents and trade marks, where Australian applicants filed the majority of applications. Most designs outside Australia came from Sweden and the United States.

Table 5: Design applications by applicant country.

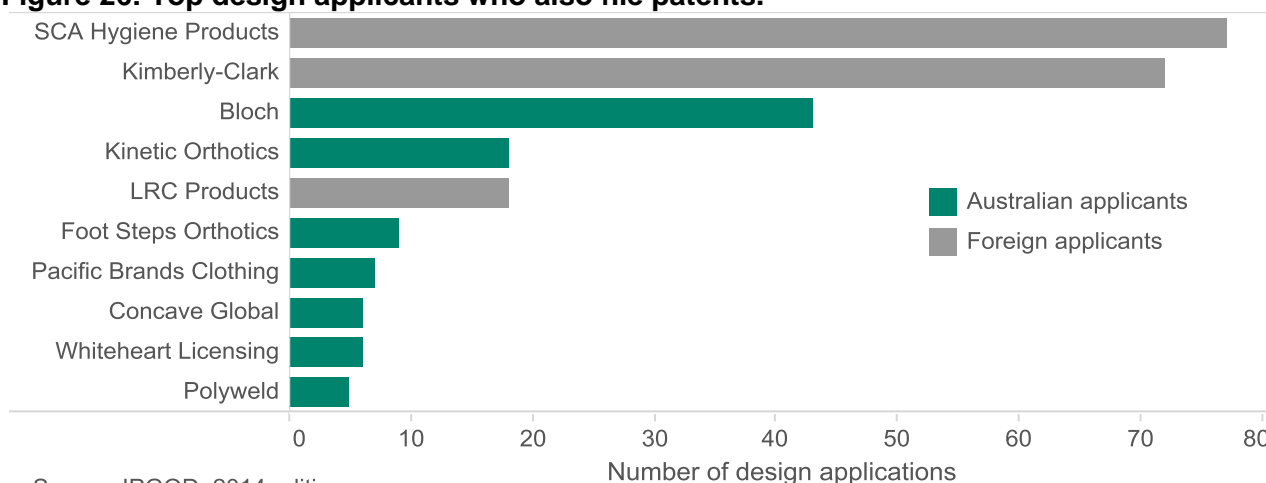
Applicant country	Number of applications	Percentage of applications (%)
Australia	143	44.8
Sweden	77	24.1
United States	75	23.5
Great Britain	21	6.6
Switzerland	3	0.9

Source: IPGOD, 2014 edition

4.2.3 Key applicants

Figure 26 shows the top 10 design applicants who also own patents. The top two design applicants are overseas firms: SCA Hygiene Products (Sweden) with 77 design applications, and Kimberly-Clark Worldwide (United States) with 72 design applications. These two foreign applicants are identified because they collaborate with Australian inventors or applicants on their patent applications. There are three patents filed by SCA Hygiene Products with Australian collaborators: WO 2005/120413, WO 2007/001216 and WO 2011/002357.

Figure 26: Top design applicants who also file patents.



Source: IPGOD, 2014 edition

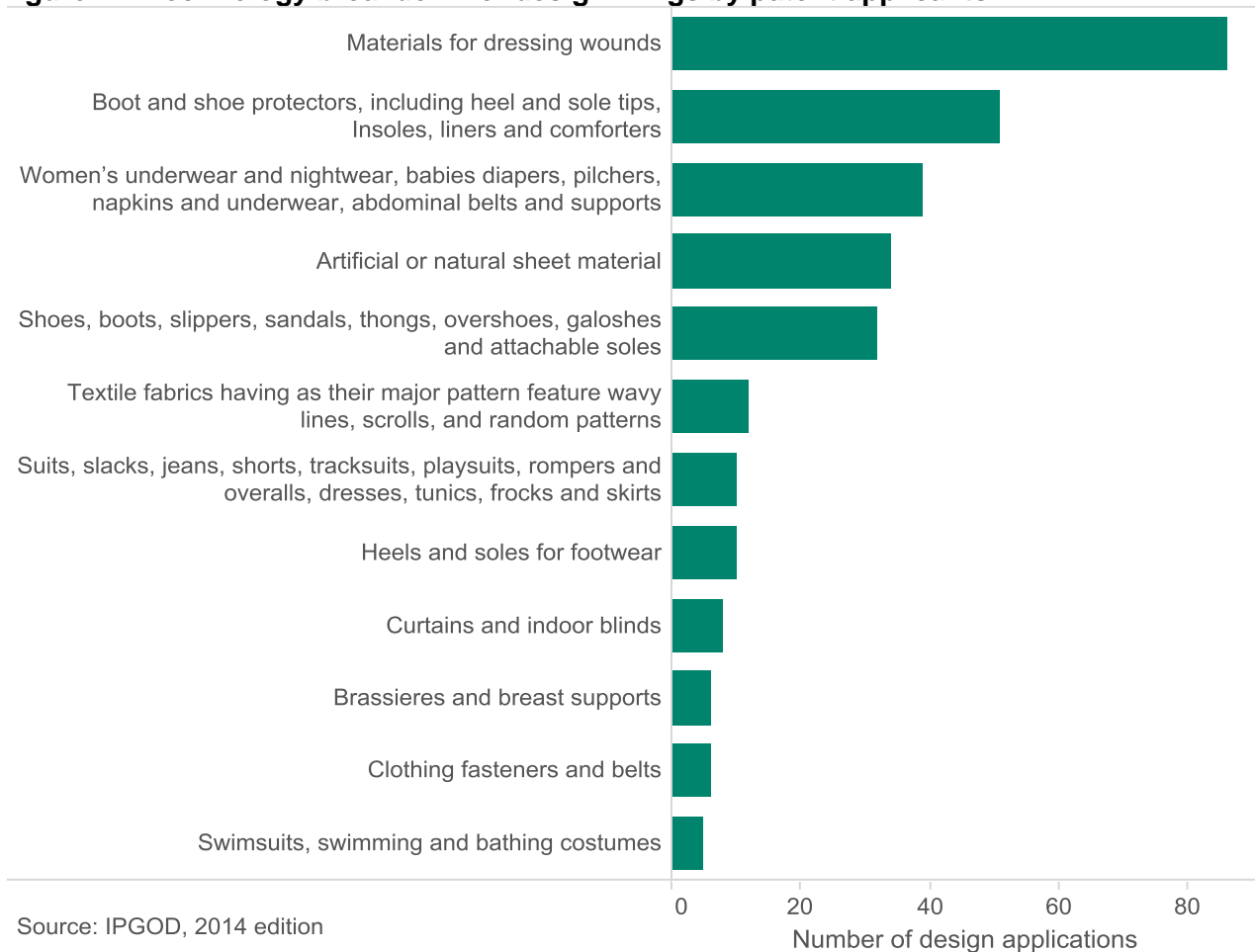
It is important to note the distinction between designs filed by patent applicants, as in Figure 26, and the full design dataset (Figure 23). The designs filed by patent applicants contain foreign applicants, as discussed above. International collaborations with Australian inventors or applicants do not appear in the full design dataset (Figure 23), because those data are solely based on design applications by Australian applicants.

Seven of the top 10 design applicants are Australian entities. Bloch is the leading Australian applicant with 43 design applications; they also have 41 trade marks and one patent. The next Australian applicants are Kinetic Orthotics (18 designs), Foot Steps Orthotics (nine) and Pacific Brands Clothing (seven). Pacific Brands has a comprehensive TCF-related IP portfolio comprising two patents, 293 trade marks and seven designs (see Box 9).

4.3 Types of designs

Figure 27 represents the breakdown of technology areas for designs filed by patent applicants. Three of the top four classes are related to biomedical technologies such as bandages, nappies and artificial/natural sheet materials, and reflect the greater design activities of the large foreign corporations, SCA Hygiene Products and Kimberly-Clark Worldwide. Compared to TCF design filings as a whole, footwear is more prominent in the patent subset. This is due to companies like Bloch, LRC Products, Kinetic Orthotics and Foot Steps Orthotics, who have applied for design rights in addition to filing patents in the areas of dance shoes, foot protectors and orthotic insoles, respectively. This may suggest that using a combination of patents and designs is a relevant strategy for footwear innovators.

Figure 27: Technology breakdown of design filings by patent applicants.

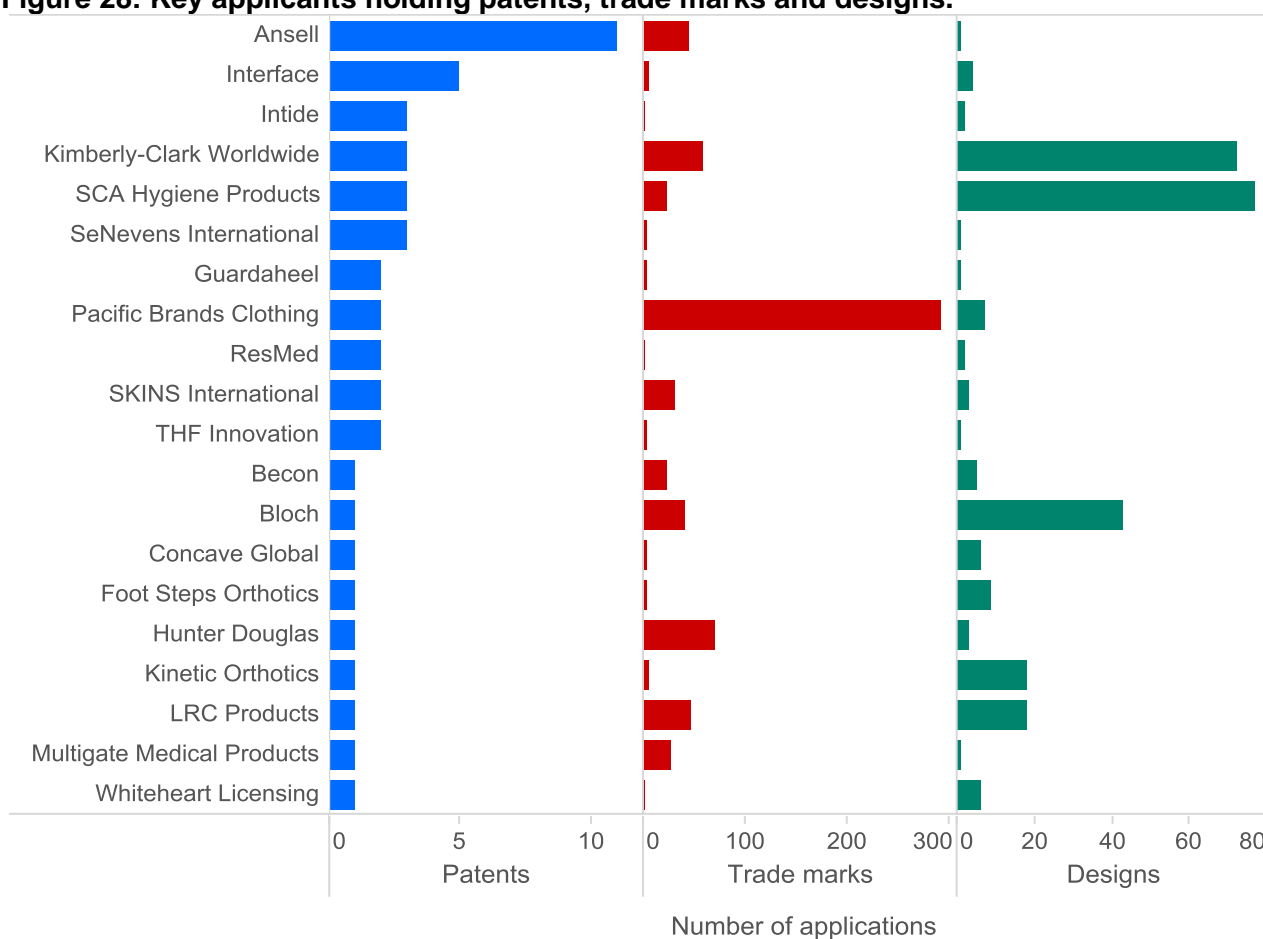


5 Summary of IP rights in the TCF industry

We have identified 33 applicants that have filed applications across all three IP rights in this study, representing six per cent of the patent applicants in this study. Twenty-nine applicants are Australian. The remaining four applicants are foreign firms: Kimberly-Clark Worldwide (United States), SCA Hygiene Products (Sweden), SKINS International (Switzerland) and LRC Products (Great Britain).

As shown in Figure 28, the top applicant differs for each of the three IP rights studied: Ansell holds the most patents, while Pacific Brands Clothing filed the most trade marks (see Box 9), and SCA Hygiene Products leads the way in designs. A complete list of applicants that filed applications across all three IP rights may be found in Appendix H.

Figure 28: Key applicants holding patents, trade marks and designs.



Source: IPGOD, 2014 edition and IP Australia calculations

This finding illustrates how applicants in differing businesses make use of the three IP rights. For Ansell, a company that sells high-technology products in a range of industries, their focus on patents is likely to help them to remain competitive in markets where technology is always evolving. Pacific Brands is mostly a clothing wholesale business, where trade marks identifying their brands in a crowded marketplace are a key focus. Companies filing a large number of designs relating to absorbent articles (Kimberly-Clark Worldwide, SCA Hygiene) or dance shoes (Bloch) are operating in a technologically mature market. Incremental changes to shape or colour can affect how their products are sold.

Most companies filing in all three IP rights filed a small number of patents and designs, and a larger number of trade marks. For example, LRC Products filed one patent, 48 trade marks and 18 designs in our dataset. SKINS International filed two patents, 31 trade marks and three designs (see Box 8). Window furnishings manufacturer Hunter Douglas filed one patent, 71 trade marks

and three designs (see Box 4). One exception is carpet manufacturer Interface, with four or five applications across each of the three IP rights studied.

Box 8: SKINS International Trading

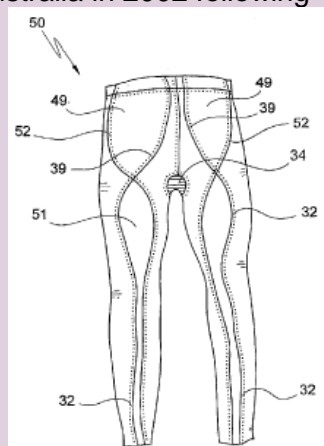


Source: Trade mark 1106064

SKINS' story began in Australia in 1996 while a Sydney physiologist and his chiropractor wife were on a ski trip, lamenting the effects of age on their performance and recovery.³⁶ SKINS initially manufactured warp-knit compression garments for amateur and professional

athletes in Sydney, with the first pair of SKINS tights launched in Australia in 2002 following extensive research and development.³⁷ In 2009, the Australian-owned company moved its global head office to Switzerland, with regional offices in the UK, USA, France, Germany and Australia.³⁸

SKINS compression garments claim to enhance comfort, prevent injury, assist with muscle oxygenation, and reduce lactic acid build-up during activity and in post-exercise recovery. SKINS spent five years researching and developing their first pair of compression tights. SKINS sell more than 160 products in over 31 countries, and manufacture more than 100 000 units per month. SKINS hold two PCT applications in our dataset (WO 2006/032096 and WO 2010/132950), 31 trade marks and three registered designs. A third PCT application, WO 2002/064073 is attributed to the SKINS founder under the firm name Compression Garment Technologies Pty Ltd.



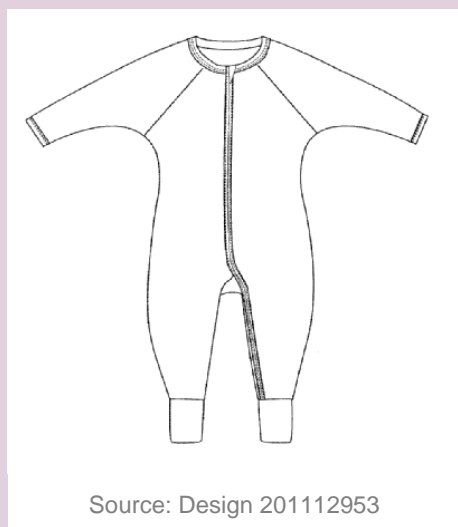
Source: WO 2006/032096

³⁶ 'Compression Apparel Brand Winning at the "Skins" Game', Apparel Magazine, 5 November 2008

³⁷ See [SKINS Values & History](#)

³⁸ See [SKINS International Subsidiaries](#)

Box 9: Pacific Brands Clothing



Pacific Brands Clothing, together with former subsidiary CTE Pty Ltd (Can't Tear 'Em workwear) hold three patents, 295 trade marks and eight registered designs. They are the top trade mark applicant that also has patents in its IP portfolio, filing over three times more applications than the nearest firm, Bendon (see Figure 18), and the top trade mark applicant over all.

The three patents (WO 2004/023904, WO 2007/009171 and WO 2007/101300) are directed to an open-toe garment such as a stocking, a vest-like garment for storing or carrying items such as law-enforcement equipment, and a stretchy sock that fits a range of foot sizes. Trade marks pertain to the company's many clothing, underwear and homewares brands, including Berlei, Bonds, Holeproof, Kayser, Razzamatuzz, Stubbies and Tontine. The designs

primarily relate to Bonds infant garments, with one design for a sports brassiere, one for maternity underwear and one for workwear.

Pacific Brands closed many of its Australian manufacturing sites in February 2009, moving its clothing manufacturing focus to Asia. The company is headquartered in Melbourne and operates throughout Australia, China, Dubai, Indonesia, New Zealand, the UK and the USA.³⁹

Fifty-two companies filed patents and trade marks, but not designs. Six of these are Australian publicly funded research organisations: the CSIRO, Deakin University, NewSouth Innovations, James Cook University, the University of Melbourne and the University of Western Australia. The CSIRO filed six trade marks; most universities filed just one or two branding-related trade marks.

The CSIRO is the top patent applicant in this subset of the data, with 24 PCT applications. New Zealand-based lingerie company Bendon filed the most trade marks (77) and a single patent to subsidiary Pleasure State.

There are far fewer instances of applicants filing a PCT application and design application, but not a trade mark. Just eight companies populate this subset of the data, with Kuver Designs as the top patent applicant with two nappy-related PCT applications (WO 2005/084601 and WO 2009/043101) and two designs for stretchy belts used with nappies and pads. The applicant with the most designs was Polyweld, with five designs and one PCT application (WO 2010/130001), all relating to vehicle side curtains.

³⁹ Pacific Brands, [Our Company](#)

6 Conclusion

This report used the scale and intensity of patent activity related to the textiles, clothing and footwear (TCF) industry, as well as trade marks and designs, to provide an overview of innovation originating from Australia.

Our analyses showed that only a small number of Patent Cooperation Treaty (PCT) applications were filed within the Australian TCF industry during the time period studied. We identified 590 TCF-related PCT applications with a priority date between 1 January 2000 and 31 August 2012.

The 590 PCTs resulted in only 155 granted Australian patents. The majority of PCT applicants progressing to national-phase entry chose to pursue patent rights in Australia, followed by the United States, European Union, China and Japan.

The number of PCT filings was the result of a cumulative effect of single filers, with 89 per cent of applicants filing only one PCT application. Major applicants who filed more than one PCT included the Commonwealth Scientific and Industrial Research Organisation (CSIRO) with 24 applications, followed by Ansell with 11 and Australian Wool Innovation (AWI) with six.

The technological subsectors where most inventions occurred are clothing and homewares, along with medical applications of textiles. Across each technology sector and all years, the majority of applicants filed just one or two PCT applications in one year. Notable exceptions are the top three patent applicants: CSIRO filed in advanced manufacturing or new materials in most years of this study; Ansell filed six applications since 2009 in the finished clothing category; and AWI filed their six applications in four years, all in advanced manufacturing or new materials technology areas.

The presence of multiple applicants on a patent application may be used as a proxy indicator for collaboration. The level of collaboration within the Australian TCF industry is low and is mainly done domestically. Only 11 per cent of the PCT applications identified involved multiple applicants, with a large percentage of Australian applicants and inventors collaborating with each other. Within this subset, State and Federal Government-funded programs, such as AusIndustry grants or Enterprise Connect's 'Researchers in Business' program, appear to be a catalyst for beneficial knowledge transfer between industry and publicly funded research organisations. Both the CSIRO and Deakin University have worked with small-to-medium enterprises (SMEs), leading to patentable inventions which, if successfully commercialised, have helped the SMEs to remain competitive in niche technologies.

A broad analysis of trade marks relevant to the TCF industry demonstrated that the majority of applicants were using trade marks for marketing purposes, not linked to innovation. They were filing trade marks only as part of a branding strategy, thus making it difficult for meaningful analysis.

Limiting the trade mark applicants to those who filed at least one PCT application resulted in 1087 trade mark applications. Major applicants included Pacific Brands, who filed 27 per cent of the trade marks, as well as Hunter Douglas and Bloch. Clothing, footwear and headgear make up the majority (44 per cent) of these trade mark applications, attributed to top trade mark applicants like Pacific Brands, Bendon, Bloch and LRC Products.

Of the three IP rights analysed independently, designs appear to be a major and important form of innovation in the context of the TCF industry. The number of design applications in our dataset far outweighed the number of patent applications. Forever New is the top design applicant with 658 applications (10 per cent of the total number of applications), followed by JETS Swimwear with 240 applications and Review Australia with 181 applications. Australian applicants predominantly filed clothing designs, as opposed to designs classified as footwear or protective clothing.

The majority of patent applicants and inventors are in New South Wales, in contrast with trade mark and design activities, which are concentrated in Victoria where the head offices for major applicants Forever New Clothing and Pacific Brands are located.

A trend across all IP rights analysed was that individuals and small-to-medium enterprises (SMEs) were the major filers. There was little overlap between the major applicants in each IP right, suggesting that different sectors of the industry use IP rights differently.

Thirty-three of the 541 PCT applicants also filed trade mark and design applications. Within this subset, the top applicant differed for each IP right: Ansell dominated patents, while Pacific Brands led in trade marks and Bloch was the top Australian design applicant. However, Swedish company SCA Hygiene Products was the top design applicant overall. Other foreign entities common to each IP right were Kimberly-Clark Worldwide (United States), SKINS International (Switzerland) and LRC Products (Great Britain). Fifty-two applicants filed patents and trade marks, led by the CSIRO, but filed no designs. Only eight applicants filed patents and designs, but no trade marks. Based on these results, innovation as represented by Australian PCT applications in the TCF industry is not commonly represented by trade marks and designs as well.

Appendix A: Methodology

The identification of patent, trade mark and design applications associated with textiles technology was done in six phases:

Phase 1: PATSTAT search

The study drew on patent data from:

- AusPat: Australian patent database administered by IP Australia;
- IPGOD: Australian Intellectual Property Government Open Data;
- Worldwide patent statistical database (PATSTAT), Spring 2014 edition, developed by the EPO, covering data from over 100 countries; and
- OECD REGPAT database, July 2014 edition, developed by the OECD and derived from the PATSTAT and EPOline databases.

The patent search used Boolean logic and encompasses Australian-originating PCT applications containing at least one international patent classification (IPC) mark related to the textiles, clothing and footwear (TCF) industry (Appendix B) and/or at least one TCF-related keyword in the title or abstract (Appendix C), in conjunction with patent analyst expertise in specific technologies.

The first phase of the search was to identify the patent applications relevant to the TCF industry filed via the Patent Cooperation Treaty (PCT) route with a priority date between 2000 and 2013. Patents were identified as being relevant to the textile using keywords and international patent classifications (IPC) marks in the PATSTAT database.⁴⁰

Phase one of the search identified 590 unique applications from the PATSTAT database.

Phase 2: IPGOD—Patents

The IPGOD only contains bibliographic information on patent applications filed in Australia between 1990 and 2013 obtained from IP Australia databases.

Therefore the match firm level IPGOD tables contain a record for those PCT applications which have entered national phase in Australia as of 31 December 2013 and are open for public inspection.

A schematic showing the link between the PATSTAT and the IPGOD database is shown in Figure 29.

The national-phase entries (NPEs) for PCT applications can be identified in PATSTAT by cross-referencing the 'appln_id' against 'internat_appln_id' in the PATSTAT database. A schematic showing the link between the PCT applications and their corresponding NPE applications are shown in Figure 30.

⁴⁰ October 2014 edition of the PATSTAT database.

Figure 29: Data schema between the PATSTAT and the IPGOD.

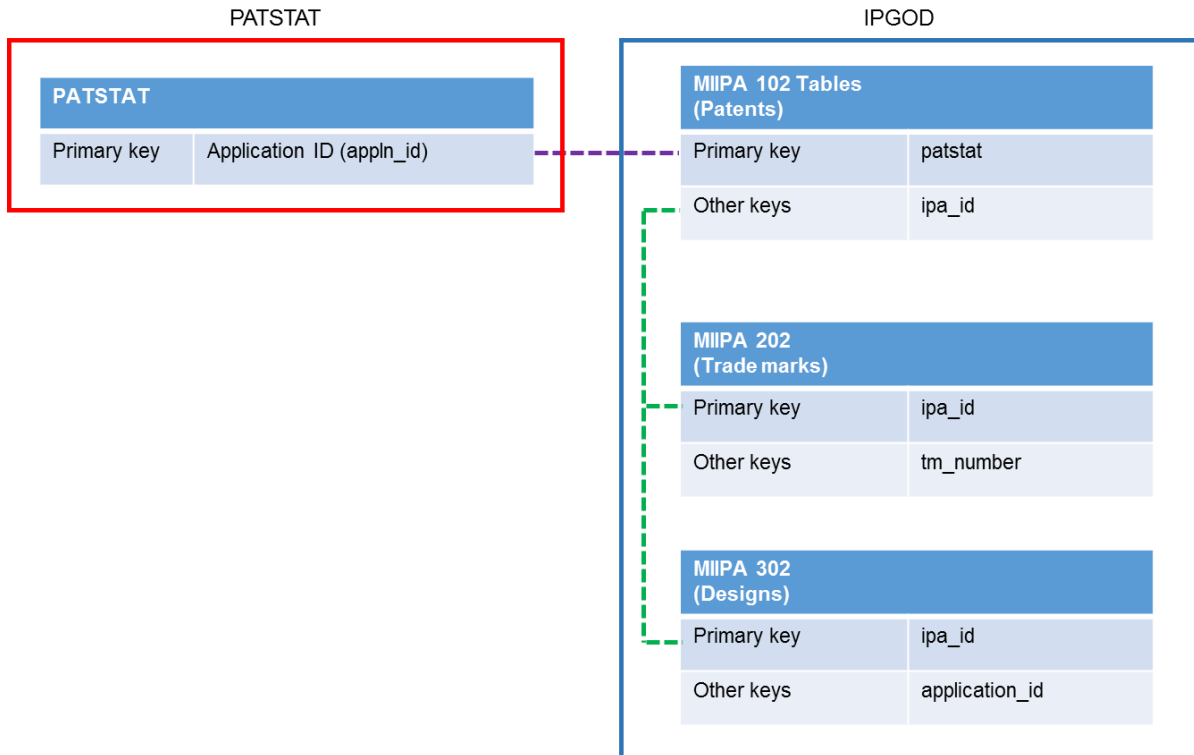
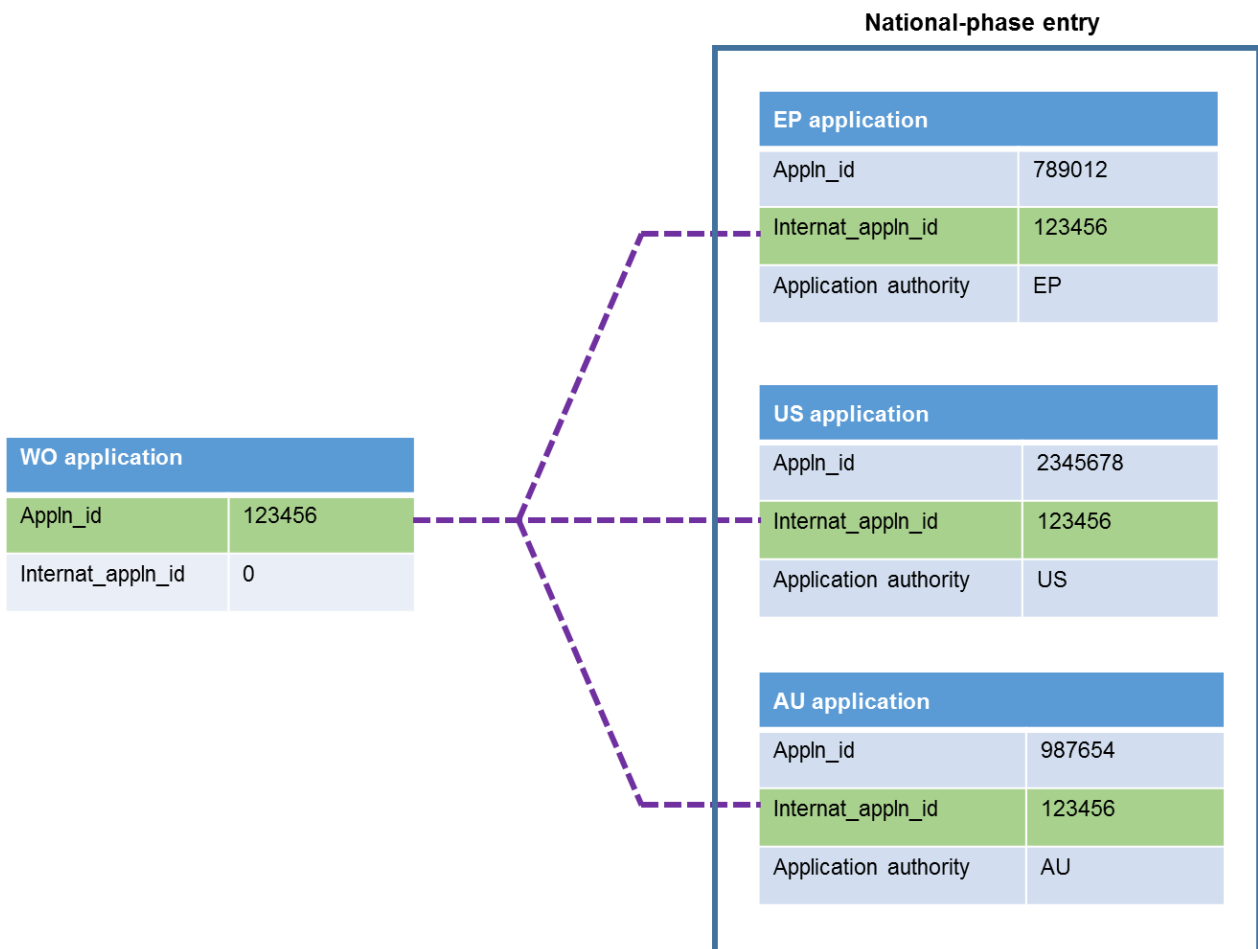


Figure 30: Relationship between a WO application and corresponding national-phase entries.



Australian NPE applications are identified by selecting applications with the value 'AU' in the 'appln_auth' field in the PATSTAT database.

Based on the 590 unique applications identified in the first phase of the search, a total of 355 Australian NPE applications were found.

Using a combination of either 'appln_id' or 'appln_nr' from PATSTAT the bibliographic and firm-level information of the Australian NPE applications were retrieved from a subset of the MIIPA 102 table containing only Australian-based applicants.

In preparation for the search of the trade mark and designs a list of unique of applicants and their corresponding ipa_id⁴¹ were also generated. The unique variable 'ipa_id' is assigned to each cleaned applicant name and is used to link all of the IP rights held by that entity.

Based on the applications above, 341 unique applicants and their ipa_id were identified.

Phase 3: IPGOD—Trade marks

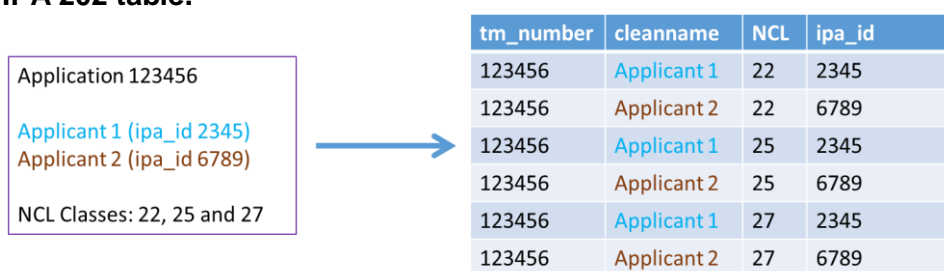
The study drew on trade mark data from the IPGOD.

We identified Australian trade mark applicants who filed in TCF-related classification marks. We used selected Nice Classification (NCL) marks to identify applicants with an Australian address within the filing period 2000-2013 (Appendix D: Nice Classifications searched). A high number of irrelevant trade mark applications derived from broad classes 5, 9 and 10 were excluded from the analysis via manual cleaning. Therefore, NCL classes 18 and 22–27 form the bulk of classes to the TCF technology, and were used to identify the trade marks.

Under Australian legislation, a single trade mark application may be associated with goods or services relating to multiple NCL marks. To account for trade mark applications containing more than one NCL mark, a modified MIIPA 202 table was constructed.

Where a trade mark application has more than one NCL mark, a record for each applicant associated with that application is created for each of the NCL marks recorded against that application. An illustrative example of this is shown in Figure 31.

Figure 31: Representation of the trade mark applications with multiple NCL marks in the modified MIIPA 202 table.



Phase 4: IPGOD—Trade marks of patent applicants

From the list of unique ipa_id generated in Phase 2, all trade mark applications primarily in the NCL classes 22 to 27 associated with said applicants were extracted. However, due to the broad nature of the types of products associated with the textile industry, selected applications from classes 5, 9, 10 were also included in the dataset. Administrative data such as the filing dates, the cleaned applicant names, lodgement routes, NCL codes, state and postcodes for these applications were obtained from the 203 table.

⁴¹ Note that the variable 'ipa_id' is equivalent to the variable 'group_ipa_id' used to query SQL for the cleaned applicant name that links all of the IP rights held by that entity.

Phase 5: IPGOD—Designs

The study drew on design data from the IPGOD.

We identified Australian textile design applications filed between 2000 and 2013 using the Australian Designs classification (ADC). The ADC is based on the Locarno classification. They can be used interchangeably as they share the common broad classes. The distinction between these two classification systems occurs only in the lower subclasses upon which the ADC has its own unique alphabetical codes. ADC classes 2 and 5, and subclasses in classes 3, 6, 9, 15, 24 and 30 were identified as the most relevant classes to the textile industry (see Appendix E for a detailed list of classes and subclasses).

Under Australian legislation, multiple types of design products as represented by the classification codes can be associated with a single design application. To account for design applications containing more than one mark, a modified 302 table was constructed. Administrative data such as the filing dates, the cleaned applicant names, lodgement routes, class codes, state and postcodes for these applications were obtained from the IPGOD design tables.

Phase 6: IPGOD—Designs of patent applicants

From the list of unique ipa_id generated in Phase 2, all design applications primarily in ADC codes 2, 5 and subclasses of codes 3, 6, 9, 15, 24 and 30 were identified.

Appendix B: Patent classes searched

IPC mark	Description
A41B	Shirts; underwear; baby linen; handkerchiefs
A41C	Corsets; brassières
A41D	Outerwear; protective garments; accessories
A41F	Garment fastenings; suspenders
A41H	Appliances or methods for making clothes, e.g. for dress-making, for tailoring, not otherwise provided for
A42B	Hats; head coverings
A42C	Manufacturing or trimming hats or other head coverings
A43B	Characteristic features of footwear; parts of footwear
A43C	Fastenings or attachments for footwear; laces in general
A43D	Machines, tools, equipment or methods for manufacturing or repairing footwear
A45C	Purses; luggage; hand carried bags
A45F	Travelling or camp equipment; sacks or packs carried on the body
A47C	Sofas; couches; beds
A47G9	Bed-covers; counterpanes; travelling rugs; sleeping rugs; sleeping bags; pillows
A47G27	Floor fabrics; fastenings therefor
A47H	Furnishings for windows or doors
A47K10	Body-drying implements; toilet paper; holders therefor
A61F5	Orthopaedic methods or devices for non-surgical treatment of bones or joints
A61F13	Bandages or dressings
B60R13	Elements for body-finishing, identifying, or decorating; arrangements or adaptations for advertising purposes
B68B	Harness; devices used in connection therewith; whips or the like
B68C	Saddles; stirrups
C03B	Manufacture or shaping of glass, or of mineral or slag wool; supplementary processes in the manufacture or shaping of glass, or of mineral or slag wool
C11B11	Recovery or refining of other fatty substances, e.g. lanolin, waxes
C14B	Mechanical treatment or processing of skins, hides, or leather in general; pelt-shearing machines; intestine-splitting machines
C14C	Treating skins, hides or leather with chemicals, enzymes or micro-organisms, e.g. tanning, impregnating or finishing; apparatus therefor; compositions for tanning
D01B	Mechanical treatment of natural fibrous or filamentary material to obtain fibres or filaments, e.g. for spinning
D01C	Chemical or biological treatment of natural filamentary or fibrous material to obtain filaments or fibres for spinning; carbonising rags to recover animal fibres
D01D	Mechanical methods or apparatus in the manufacture of man-made filaments, threads, fibres, bristles or ribbons
D01D	Mechanical methods or apparatus in the manufacture of man-made filaments, threads, fibres, bristles or ribbons
D01F	Chemical features in the manufacture of man-made filaments, threads, fibres, bristles or ribbons; apparatus specially adapted for the manufacture of carbon filaments

D01G	Preliminary treatment of fibres, e.g. for spinning
D01H	Spinning or twisting (unwinding, paying-out, forwarding, winding, or coiling filamentary material, not intimately associated with spinning or twisting)
D02G	Crimping or curling fibres, filaments, yarns, or threads; yarns or threads
D03D	Woven fabrics; methods of weaving; looms
D04B	Knitting
D04H	Making textile fabrics, e.g. from fibres or filamentary material
D05C	Embroidering
D06B	Treating textile materials by liquids, gases, or vapours
D06C	Finishing, dressing, tentering, or stretching textile fabrics
D06F	Laundering, drying, ironing, pressing or folding textile articles
D06G	Mechanical or pressure cleaning of carpets, rugs, sacks, hides, or other skin or textile articles or fabrics; turning inside-out flexible tubular or other hollow articles
D06H	Marking, inspecting, seaming, or severing textile materials
D06J	Pleating, kilting, or goffering textile fabrics or wearing apparel
D06M	Treatment, not provided for elsewhere in class D06, of fibres, threads, yarns, fabrics, feathers or fibrous goods made from such materials
D06N	Wall, floor, or like covering materials, e.g. linoleum, oilcloth, artificial leather, roofing felt, consisting of a fibrous web coated with a layer of macromolecular material; flexible sheet material not otherwise provided for
D06P	General processes of dyeing or printing textiles or general processes of dyeing leather, furs or solid macromolecular substances in any form, classified according to the dyes, pigments or auxiliary substances employed
D06Q	Decorating textiles
D07B	Ropes or cables in general
E04F10	Sunshades; awnings
E04H15	Tents or canopies, in general
E06B9	Screening or protective devices for openings, with or without operating or securing mechanisms; closures of similar construction
F41C33	Means for wearing or carrying small arms
F41H1	Personal protection-gear
F41H5	Armour; armour plates
F41H7	Armoured or armed vehicles
F42B39	Packaging or storage of ammunition or explosive charges; safety features thereof; cartridge belts or bags
G06Q 50/04	Manufacturing

Appendix C: Keywords used in patent search

(synthetic or natural) fiber/fibre	leather
apparel	linen
awning	lint
backpack	luggage
bag	Lycra
bedclothes	mat
bedlinen	mattress
belt	midsole
biotextile	nanofiber/nanofibre
blanket	netting
blind	nonwoven
blouse	nylon
boot	orthotic
bra	outsole
brassiere	pillow
canvas	polyester
carbon fiber/fibre	polyethylene
cardigan	polypropylene
carpet	pullover
carrier	roving
cellulosic/e fiber/fibre	rug
clothes	sack
cordage	sandal
cotton	shirt
curtain	shoe
cushion	shoelace
drape	silk
dye	slacks
fabric	slipper
filament	sliver
floor cover	sneaker
footgear	sock
footwear	sole
garment	spinneret
geotextile	stirrup
glass fiber/fibre	stocking
glove	suit
handbag	sweater
handkerchief	tanning
hat	tent
headgear	textile
headwear	thong
heel	thread
helmet	towel

hide	trousers
holster	twine
hosiery	undergarment
insole	viscose
instep	wetsuit
jeans	wool
jumper	woven
Kevlar	yarn
knit	

Appendix D: Nice Classifications searched

Nice Classification	Class heading
5	Materials for dressing/bandages, absorbent articles and diapers, clothing for medical use
9	Protective gloves, clothing and footwear
10	Compression and pressure garments, orthopaedic pads, socks and bandages, surgical garments
18	Leather, animal hides, harness and saddlery
22	Ropes, padding and stuffing materials, raw fibrous textile material
23	Yarns and threads, for textile use
24	Textiles and textile goods, bed and table covers
25	Clothing, footwear, headgear
26	Lace and embroidery, ribbons and braid
27	Carpets, rugs, mats and matting

Appendix E: Australian Designs Classification Codes searched

Below is the list of ADC codes used in the search. As discussed previously, they are the same as the Locarno codes used internationally at the broad class level. For example, 02-01 is the same code in both the ADC and Locarno classification. The ADC uses letters to create further subclasses in the categories as in, for example, 02-01A, 02-01B and 02-01Z.

Australian Designs Classification	Class heading
02-01A	Brassieres and breast supports
02-01B	Women's underwear and nightwear; babies' diapers, pilchers, napkins and underwear; abdominal belts and supports
02-01Z	Men's and boy's underwear and nightwear' shirts, shirt collars, sleeves and cuffs
02-02A	Swimsuits, swimming and bathing costumes
02-02B	Protective clothing, including: aprons, tradesmen's clothing, raincoats, wetsuits
02-02C	Suits, slacks, jeans, shorts, tracksuits, playsuits, rompers and overalls, dresses, tunics, frocks and skirts
02-02Z	Upper-body garments: t-Shirts, blouses, cardigans, coats
02-03	Headwear
02-04A	Boot and shoe protectors, including heel and sole tips; insoles, liners and comforters
02-04B	Heels and soles for footwear
02-04C	Socks, stockings, panty-hose, leg warmers, gaiters
02-04Z	Shoes, boots, slippers, sandals, thongs, overshoes, galoshes and attachable soles
02-05	Neckties, scarves, neckerchiefs and handkerchiefs
02-06	Gloves and mittens
02-07A	Clothing fasteners and belts
02-07B	Footwear fasteners, trimmings and decorations
02-07C	Hat bands, hat shapers and other parts of hats
02-07D	Hand sewing, knitting, weaving and embroidery equipment
02-07Z	Haberdashery and clothing accessories
02-99	Miscellaneous clothing and haberdashery
03-01A	Suitcases, briefcases, attaché cases
03-01B	Handbags, purses, wallets, pouches, key rings and holders, coin holders, map holders, tag and ticket holders
03-01C	Cases and covers for sporting goods, equipment and guns
03-01D	Beauty, vanity, make-up cases and bags
03-01Z	Cases
05-01	Spun articles including yarn and thread
05-02	Lace
05-03	Embroidery
05-04	Ribbons, braids and other decorative trimmings
05-05A	Textile fabrics having as their major pattern feature flowers and leaves
05-05B	Textile fabrics having as their major pattern feature spots, dots, circles, rings and ovals

05-05C	Textile fabrics having as their major pattern feature animals, humans and inanimate objects such as toy figures, fish, birds, buildings, vehicles and landscapes
05-05D	Textile fabrics having as their major pattern feature straight lines, stripes, and regular checks, including tartans and similar designs
05-05Z	Textile fabrics having as their major pattern feature wavy lines, scrolls and random patterns
05-06A	Wall paper
05-06B	Plastic sheeting, including sheet vinyl, linoleum and laminates
05-06Z	Artificial or natural sheet material
05-99	Miscellaneous, includes wadding
06-09	Mattresses and cushions
06-10	Curtains and indoor blinds
06-11	Carpets, mats and rugs
06-13A	Table linen, including tablecloths, place mats and doilies
06-13B	Bed linen, including blankets, sheets, pillow cases, doona and quilt covers, bed spreads
06-13C	Towels, including tea towels
06-13Z	Blankets, household linen, napery, including seat covers, car seat covers and tissue box covers
09-05	Bags, sachets, tubes and capsules
09-06	Ropes and hooping materials
15-06	Textile, sewing, knitting and embroidering machines
24-04	Materials for dressing wounds
30-01	Animal clothing
30-04	Saddlery including collars for animals

Appendix F: Subsectors of the TCF industry

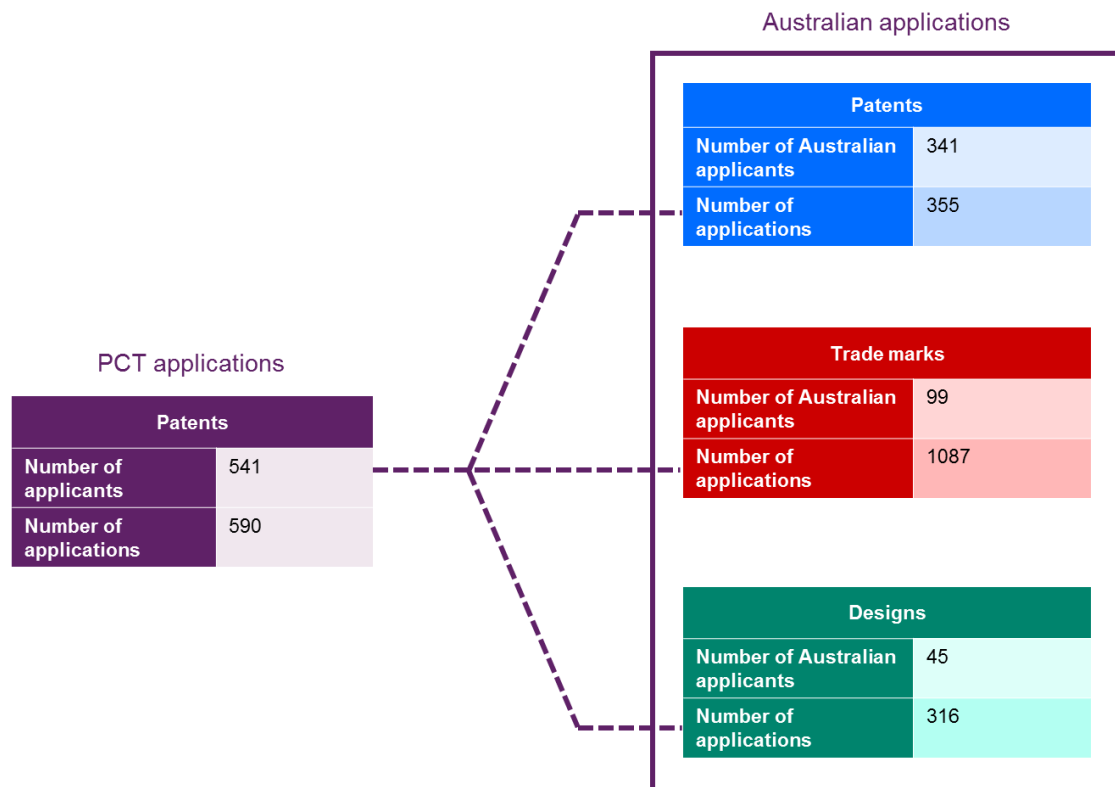
Subsector	Description
Advanced manufacturing	The textile sector is adopting advanced manufacturing processes and models that allow growth into the Asian market for Australian high quality, low volume, fast turnaround personalised production in areas such as 'smart' protective textiles for the military and emergency services, textile composites for aerospace, automotive and marine applications, medical textiles including tissue engineering scaffolds, filtration textiles for water and energy applications, fibrous materials as components of mobile phones and batteries and large scale applications in mining, agriculture, aquaculture and horticulture.
Carpet	Carpet manufacturing is the process of inserting pile yarns into a previously manufactured base fabric to form the 'use-surface' and then applying one or more layers ('substrate'), which provides dimensional stability and/or acts as a cushion. All carpet manufacturers use tufting in Australia. The alternative method of weaving carpets is more labour intensive and the last plant in Australia ceased operation in 2010.
Finished articles	Finished articles other than clothing, e.g. curtains, sleeping bags
Finished clothing	Finished garments, including hats and vests
Footwear	Footwear manufacturing is the process of designing, engineering, cutting, stitching and making leathers and man-made materials into an upper, insole, outsole and heel around a wood, plastic or metal last.
General textiles	Manufacture of textiles in general
Geotextiles	Civil engineering and other applications including roads, airfields, railroads, embankments, retaining structures, reservoirs, canals, dams, bank protection, coastal engineering and construction site silt fences
Industrial	Used in a broad range of industry sectors including storage, food handling, filtration, sails, covers and netting, and power generation
Leather	Leather is a textile product made from the skin of animals that has been chemically treated or 'tanned' to give it desirable properties such as resilience, flexibility and a whole range of specifications that can be required by end users. The Australian leather industry consists of bovine (cattle), kangaroo and sheepskin tanning industries (either part or fully processed).
Medical and biomedical textiles	Includes bandages, wound dressings, hospital linen, preventive clothing and absorbent articles. Biotextiles include implantable devices such as surgical sutures, hernia repair fabrics, arterial grafts, artificial skin and parts of artificial hearts.
New materials	Glass fibre is commonly used as an insulating material and a reinforcing agent for many polymer products to form a very strong and light fibre-reinforced polymer composite material. New materials such as carbon fibre are being increasingly used in Australia.

Protective	Designed to have extra values in protection, in addition to comfort and durability, against hazards such as heat, chemical, biological or physical impact.
Sport	Two broad groups include sporting uniforms and tailored equipment and performance fabrics, for example, weight, streamlining and heat control clothing and equipment.
Transport	Examples used in the construction of automobiles, railways, ships and aircraft include: PVC coated polyester truck covers, car interiors, seat covers, seat belts, non-wovens for cabin air filtration, airbags, parachutes, inflatable boats, air balloons.

Appendix G: Summary of data extraction of Australian IP rights in the TCF industry

Figure 32 summarises the findings of Phases 1 and 2 of the data extraction and analysis discussed in section 1.6, with PCT applications in purple and national-phase entry of patent applications in blue. The trade marks (red) and designs (green) tallied in the figure relate only to Phases 3 and 5, respectively. That is, the trade mark and design applications in Figure 32 were associated with the 541 unique patent applicants from the PCT dataset in Phases 1 and 2.

Figure 32: IP rights in the Australian TCF industry from 2000-2013.



Appendix H: Entities holding patents, trade marks and designs

Company name	Patent applications	Trade mark applications	Design applications
Ansell	11	45	1
Because We Care	1	1	1
Becon	1	23	5
Bloch	1	41	43
Bra Buddy	1	2	1
Bubbaroo	1	6	1
Concave Global	1	4	6
CTE	1	2	1
Curvessence	1	5	1
DaVIDDA	1	1	2
Foot Steps Orthotics	1	3	9
Guardaheel	2	3	1
Hidez	1	1	1
Hunter Douglas	1	71	3
Interface Aust	5	5	4
Intide	3	1	2
IPX	1	1	1
Iqonic	1	2	2
Kimberly-Clark Worldwide	3	59	72
Kinetic Orthotics	1	6	18
LRC Products	1	48	18
McNally Holdings	1	2	1
Mentec Holdings	1	3	4
Multigate Medical Products	1	28	1
Omicron Industries	1	1	1
Pacific Brands Clothing	2	293	7
ResMed	2	1	2
SCA Hygiene Products	3	23	77
SeNevens International	3	4	1
SKINS International Trading	2	31	3
THF Innovation	2	4	1
Vuly	1	5	2
Whiteheart Licensing	1	2	6

Appendix I: Correspondence of IP rights classifications with ANZSIC divisions

The Australian Bureau of Statistics collects and reports on data by industry sector. The information is compiled by the categories of the Australian and New Zealand Standard Industrial Classification (ANZSIC) 2006.⁴² Using the IPGOD tables, we developed concordance tables for classification schemes used in patents, trade marks and designs against ANZSIC divisions.

Figure 33 relates to TCF patent applicants from Phases 1 and 2 of the data extraction (see section 1.6). Figure 34 and Figure 35 match ANZSIC divisions to trade marks and designs from Phases 4 and 6, respectively. Figure 36 and Figure 37 present the trade mark and design concordances from Phases 3 and 5 of the data extraction, representing a broad snapshot of these two IP rights within the textiles, clothing and footwear industry.

For each of the IP rights, we mapped the relevant broad classification code for each application against the Australian and New Zealand Standard Industrial Classification 2006 (ANZSIC) codes. For patents, we developed correspondence tables for ANZSIC division (for example, division C—manufacturing) against IPC sections (for example, section A—human necessities). We developed analogous tables for the Nice Classification of trade marks and for the Australian Design Classification of designs. We found that Australian PCT applications in the TCF industry fell primarily within division C (manufacturing) followed by division M (professional, scientific and technical services) and division F (wholesale trade). Wholesale trade was clearly the primary ANZSIC division for trade mark applications, followed by division C (manufacturing), both in the Nice Classification for clothing and footwear. Designs were slightly different again, with manufacturing leading wholesale trade, both mostly in footwear-related designs, although the overall numbers were low.

Figure 33: ANZSIC-IPC concordance for TCF patents.

ANZSIC description	IPC description							
	Human necessities	Performing operations; transporting	Chemistry; metallurgy	Textiles; paper	Fixed constructions	Mechanical engineering	Physics	Electricity
Manufacturing	34	7	3	4	4	2		
Professional, scientific and technical services	15	5	2	13			3	4
Wholesale trade	11	2		1				
Rental, hiring and real estate services	7			2	1	1		
Education and training	4			6				
Financial and insurance services	4				1	1		
Retail trade	4	1			1			
Agriculture, forestry and fishing		2						
Other services	2							
Public administration and safety	1				1			

Source: IPGOD, 2014 edition

⁴² Australian Bureau of Statistics, [Australian and New Zealand Standard Industrial Classification \(ANZSIC\), 2006 \(Revision 2.0\)](#)

Figure 34: ANZSIC-Nice concordance for TCF trade marks filed by patent applicants.

ANZSIC description	NICE description								
	Clothing and footwear	Textile goods	Compression garments	Protective articles	Carpets	Dressing and diapers	Ropes	Leather	Yarns and threads
Wholesale trade	241	34	21	23	27	1	1	3	2
Manufacturing	60	69	46	6	5	19	12	1	
Education and training	14		4			1			
Financial and insurance services	5			1	1			2	
Professional, scientific and technical services	7	3	5	9		9			
Rental, hiring and real estate services	8		5			1	1		
Retail trade	2							2	

Source: IPGOD, 2014 edition

Figure 35: ANZSIC-design class concordance for TCF designs filed by patent applicants.

ANZSIC description	Design description									
	Shoe protectors	Footwear	Heels for footwear	Curtains	Carpets	Swimwear	Bras	Diapers	Full-body garments	Bed linen
Manufacturing	28	20	10	6	5	5	4	4		
Professional, scientific and technical services							1			
Retail trade	1									
Wholesale trade		5					1	4	3	2

Source: IPGOD, 2014 edition

Figure 36: ANZSIC-Nice concordance for TCF trade marks.

ANZSIC description	NICE description						
	Clothing and footwear	Leather	Textile goods	Carpets	Ropes	Lace	Yarns and threads
Wholesale trade	5942	1538	1367	538	437	281	103
Retail trade	4846	1290	910	260	295	219	42
Manufacturing	2657	458	1057	523	423	89	182
Professional, scientific and technical services	1641	254	233	46	63	73	21
Financial and insurance services	1439	318	264	87	114	56	11
Arts and recreation services	1298	245	167	50	21	41	3
Other services	777	150	109	11	22	141	1
Rental, hiring and real estate services	754	191	77	23	33	19	7
Information media and telecommunications	802	148	80	14	27	22	4
Administrative and support services	632	114	74	50	12	23	2

Source: IPGOD, 2014 edition

Figure 37: ANZSIC-design class concordance for TCF designs.

ANZSIC description	Design description									
	Full-body garments	Upper-body garments	Swimwear	Footwear	Bags	Handbags	Protective clothing	Fabrics with patterns	Headwear	Cases
Retail trade	652	561	5	31	7	46	22	2	3	7
Wholesale trade	201	122	225	43	30	32	33	16	18	33
Manufacturing	68	59	82	26	39	10	10	63	42	13
Professional, scientific and technical services	18	11	5	9	4	11	8		7	8
Rental, hiring and real estate services	11	12			3		1		2	
Financial and insurance services	1	1		1	13		5		4	3
Health care and social assistance	2			8	1	2				4
Accommodation and food services		5		6	2					
Construction				1		1	4	1		1
Administrative and support services		1		1	3				1	

Source: IPGOD, 2014 edition

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