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Innovation and Intellectual Property Management at the Australian Government Clothing Factory

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In 1912, the relatively new Australian government established the Australian Government Clothing Factory in South Melbourne to produce uniforms for their fledgling Army. In collaboration with the Defence Department, the factory became the driving force behind innovations, design specifications, approvals, and design protection. In times of high demand, scores of private clothing firms were contracted to deliver the required quantities of military garments. They were subject to detailed specifications describing the methods of manufacture. Innovations introduced by the Clothing Factory had long lasting effects upon the Australian clothing sector and the development of some industries, in particular the cotton industry. The manner in which these processes were managed is the subject of this paper. For the first time, archival documents provide clear evidence of the impact of the Clothing Factory's innovations and its intellectual property management of Australian military uniforms.

Introduction

The identity of a national defense force is embedded in the design and colors of the uniforms worn by its members. Over thousands of years, nations, tribes and other socio-geographic groups have traditionally marked themselves out in battle by donning clothing of distinguishing color or shape, accoutrements or other articles that would clearly identify them as belonging to their specific group. The military uniform belongs to those types of clothing that sets a group of people, that is, the defense force, apart from the rest of society. The uniform creates boundaries between those within and those without the

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URL: http://www.thebhc.org/sites/default/files/Mosseveld_BEHO_Final%20Draft_0.pdf

group.[1] Hacker and Vining identified four major reasons for the use of the uniform: control, utility, status, and symbol. [2] A uniform can be the means by which the wearer is made to conform to the regulations and behaviors of the group. It can also serve as a symbol of status and rank.[3] By its sheer visibility, the wearer is immediately identified as belonging to the group and occupying a certain rank within it. Wearing their country's military uniform also is a major part of pride and purpose felt by men and women enlisted to serve their nation, whether in peacetime or war. The military uniform signifies national identity, rank, and status and unifies those serving to protect and defend their country and the principles it represents. The uniform, according to Hacker and Vining, also has a function of utility. It must assist the wearer in performing his or her duties.

Apart from the sociological and psychological aspects of the uniform, there is another perspective to the military uniform.[4] Unlike uniforms worn by employees in, for example, offices, workshops, and supermarkets, the designs and standardization of the military uniform have been legally sanctioned and are protected by law. The uniform is the property of the nation, it is manufactured and supplied by the nation to serving men and women and replaced when necessary. There are strict design rules for the making of a military uniform and, while it is not always possible to prevent unapproved manufacture, the uniform's design and stipulated methods of the fabrication processes which must be applied are indeed the intellectual property (IP) of the nation. And just as commercial IP must be described in detail and registered with the country's IP office for protection against unlawful copying, so is every garment made for the Australian Army described in great detail, from the fabric to be used to the last stitch to be made, and is registered on a national system. The only difference between commercial IP registration and the army's system is that the former is managed by IP Australia (the government's IP office in Canberra) and the latter by the defense force administration itself.

Australian Army Uniforms and the Australian Government Clothing Factory

In Australia, military uniforms worn during the colonial era presented a wide range of very colorful garments. Each Australian colony had its own set of uniforms, often based on those worn by certain regiments in the United Kingdom. After federation in 1901, the wide diversity of uniforms was streamlined into one single uniform used by soldiers and officers alike, and from the first dress regulations issued in 1903 by Major-General Edward Hutton, a system of Commonwealth Pattern – later Australian Pattern – of army uniforms evolved. In 1912 the then Minister for Defence, Senator George Foster Pearce, established the Australian Government Clothing Factory. It was built opposite the army barracks in South Melbourne and equipped with the latest sewing machinery and other

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1. For a detailed analysis of the uniform's sociological aspects, see Nathan Joseph and Nicholas Alex, "The Uniform: A Sociological Perspective," *American Journal of Sociology* 77, 4 (1972): 719-730.

2. Hacker, Barton C. and Vining, Margaret, "Cutting a New Pattern: Uniforms and Women's Mobilization for War 1854-1919," *Textile History and the Military* 41, 1, Supplement (May 2010): 109-110.

3. Nathan Joseph and Nicholas Alex, "The Uniform: A Sociological Perspective," *American Journal of Sociology* 77, 4 (1972):725; Sean Kikkert, "Military Uniforms: The Psychological Dimension," *Australian Army Journal* 11, 2, p. 245.

4. What follows also applies to police uniforms and some other law enforcement uniforms. See Nathan Joseph and Nicholas Alex, "The Uniform: A Sociological Perspective," 719-730.

equipment. It was a state-of-the-art clothing factory for its time and it oversaw the production of all the Defence Department's uniforms for the duration of the First World War. When needed, the Clothing Factory sub-contracted production runs to private clothing firms. It continued to manufacture uniforms after the war, but concentrated on uniforms for the Postmaster-General's Department and other government departments. By the middle of the century, the Clothing Factory only produced some fifteen percent of military uniforms, the bulk being produced by private Australian clothing firms.

The standard Australian Army uniform of the First World War was made of wool, had four large pockets and was worn with cord breeches and topped with a wool felt hat of which the left brim could be turned up to allow for rifles to be worn over the left shoulder. In cold weather, a woolen greatcoat was worn over the uniform. When entering the battlefield, soldiers were issued a steel helmet which they wore in place of the felt hat. From time to time, small changes were made, either in the design, in the fabric or accessories, in the technology used, or in the manufacturing process itself, but on the whole the army uniform remained much the same until the late 1930s.

Illustration 1 – Australian Uniforms, First World War

Left: Army engineer with wire cutters and mess tin. Right: Field Service uniform with Brodie helmet. **Source**: Grantsmilitaria, www.grantsmilitaria.com (Reproduced with permission)

Design Protection and Management

Throughout the decades, the design activity was carried out in the Clothing Factory itself. Whenever a change was made, such as the removal of cuffs on sleeves, the specification for the garment was revised. After this was approved (in the early years, by the Military Board), the specification was returned to the Clothing Factory, which then produced a pattern and made up the first sample. After inspection and approval of the sample as a true representation of the specification by a specially appointed examiner, the sample was

tagged and labelled with a registration number. The sample garment thus became the official sealed pattern. Examples of sealed patterns are shown in Illustration 2A and 2B.

Illustration 2A – A Sealed Sample of Embroidered Shoulder Tabs for an Army Colonel, 1962 (front and back)

Source: Australian War Memorial – REL42185

Illustration 2B – Sealed Sample for a Women's Royal Australian Army Corps Hat, 1970

Source: Australian War Memorial, REL42138

The first set of illustrations show the sample of the shoulder tabs that were sealed and labelled in 1962. The metal seal is clearly visible in the first photo. The sample was produced by A. Warhoft, a clothing firm in Huntingdale, Victoria. It was inspected and approved by the Inspector of Stores and Clothing in Victoria. The label further indicates the registration number of the shoulder tabs. Having produced the approved sample, Warhoft would then be permitted to manufacture the shoulder tabs as specified in a contract they would have obtained.

The second set of illustrations show a sample service hat for the Women's Royal Australian Army Corps. Inside the hat is the name of the maker, Emerco, in Melbourne. The sample hat was inspected, approved, and sealed in 1970 by the Director of Inspection of the Department of the Army. The seal is attached to the label in the second photo. The label also indicates the sealed sample number under which the hat was entered into the clothing register, namely CLO 3068. After having obtained approval, Emerco manufactured the hats under contract.

The illustrations firmly establish that private firms played a role in the production of uniforms. In times of high demand for uniforms, when the Clothing Factory was unable to satisfy demand under its own steam, contractors from within the private clothing sector would manufacture the remaining production runs. They were required to produce a working sample from the Sealed Pattern for approval by a government-appointed inspector before being allowed to manufacture the full run of their contract.

The sealed pattern system and its basic elements (design, production of samples, inspection, approval, sealing) was – and remains today – a system embracing an important part of Australia's presence in the world and was treated with great respect within the army administration. A warning by Lieut. Colonel Legge, Quartermaster-General, written on 2 February 1911, to the Commandant of the Citizen Military Forces of all states except Victoria, underlines the importance of the sealed sample system,

> Cases have recently been noticed in which sealed patterns signed by the Quartermaster General have been altered without reference to Head-quarters.
>
> This is a serious matter and might involve the Government in serious loss in the event of a contract for the supply of such articles being made the subject of a suit at law.
>
> A sealed pattern is by reference made part of a contract for supply, and any alteration during currency of a contract without the consent of the Minister and the contractor is the same as an unauthorised alteration of the wording of the contract.
>
> Sealed patterns or labels attached thereto are not to be altered in any way without authority from Head-quarters.
>
> When alterations are approved from Head-quarters to be made locally, and only in such cases, a label, on which will be quoted the authority for making the alteration, will be attached to the article and signed by the D.A.Q.M.G. of the State concerned.[5]

These warnings clearly indicate that some form of administrative system was already in place prior to the First World War to record and label the army's sealed patterns. In the decade following the First World War, when the troops had returned home, the number of enlisted personnel on active duty in the Australian Military Forces remained at first steady but the size of the military force declined dramatically at the end of the decade. The number of men on the active list as of 30 April 1930 amounted to only 27,454. This number was even below that recorded at 1 March 1901, when 28,886 men were in the Military Forces. However, throughout the 1920s the training strength of the Military Forces had been between 37,156 (1922) and 47,931 (1929), but on 1 November 1929, the government introduced military training on a voluntary basis, which accounted for the drop in numbers. [6]

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5. NAA: MP84/1/0, 1990/2/35, Letter from Lieut. Colonel Legge, Quartermaster General, to Commandant, C.M. Forces of All States except Victoria, 2 February, 1911. The abbreviation D.A.Q.M.G. stands for Deputy Assistant Quartermaster-General.

6. See ABS, *Year Book Australia*, No. 23 (1930): 410.

The period of peace afforded an opportunity to consolidate the lessons learned during battle and to reinforce the army's administrative system governing the patterns, labels, and specifications of each garment on issue. This was a matter of some priority for the Military Board which had instituted a Co-Ordination Committee to establish working relationships with the Contract Board and the Munitions Supply Board on the matter of supply to the Australian military. On 14 April 1927, the Secretary of the Contract Board invited the Chief Inspector of the Munitions Supply Board to comment on the procedure to be followed. On 28 April 1927, the latter submitted a detailed proposal for the registration of military clothing patterns, which he described as "an effective and economical method of dealing with the Sealed Pattern question."

> Two articles [are] to be sealed as Patterns – One for the Service concerned; one for Munitions Supply Board.
>
> In the event of a Pattern being required for each State: Eight (8) [are] to be sealed and issued: two as above and one for each State.
>
> The Sealed Pattern [is] to be made available for those submitting tenders to view. This pattern must not be issued to contractors and must not leave Departmental Custody.
>
> When a contract has been entered into for the supply of the article, the Sealed Pattern may be taken by the Inspecting or Examining Officer to the works of the contractor, but must remain in the custody of such Officer.
>
> From the first output of work under the Contract, the Examining Officer [is] to select a sample which is equal in all respects to the Sealed Pattern and submit it for sealing.
>
> When this is done the Sealed Pattern is to be immediately returned to the Officer who is the custodian of sealed patterns.
>
> All future output [is] to be governed by the sample which could be included as part of the supplies to be made under contract.[7]

This procedure was henceforth adopted for all military clothing and ensured that the designs were protected by the use of Sealed Patterns, effectively the protected prototype for each garment. If the garments had been produced exclusively by the Australian Government Clothing Factory the need for design protection would not have been an issue, but during the war the Clothing Factory had been overwhelmed by the volume of work and had been forced to sub-contract large amounts of work to private contractors. There was always a risk that someone might make unauthorized copies of the design or deviate from the Sealed Pattern, possibly to save cost, and this set into motion the question of how the garments were to be checked and marked. The matter was raised by the Secretary of the Co-Ordination Committee in his memorandum to the Military Board on 6 February 1928, in which he recommended that the responsibility for approving working samples of all clothing manufactured should rest with the Chief Inspector. Later that year, on 26 September, he thought it desirable that a distinguishing letter for each of the three services should precede the number on the labels attached to the Sealed Patterns and specifications: "N" for Navy, "L" for Land [Army] and "A" for Air Services. He proposed that these letters be used for all items to be sealed, whether they be clothing or other specified designs in use by the services.[8] However, as many of the items were in fact prescribed across the board, this would have resulted in much duplication and it

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7. NAA: B1535, 733/1/31, Memorandum from Chief Inspector, Munitions Supply Board to the Secretary, Contract Board, 28 April 1927.

8. NAA: B1535, 733/1/31, Memorandum from Secretary, Co-Ordination Committee, to Secretary, Military Board, 26 September 1928.

appears that these recommendations were not adopted. Instead, all specifications were preceded by the letters M.S.B./Aus. (referring to Munitions Supply Board) or M.G.O./Aus. (used after 1939 when the Master-General of Ordnance Department was in charge), followed by a number which in itself would indicate the service in which the item was used. The Sealed Pattern produced for each clothing specification was prefixed with the letters "CLO." By the late 1930s, the Sealed Pattern system had become a streamlined operation within the army.

New Army Uniforms

In the late 1930s a decision was made to modernize the Australian uniform. The changes were to affect every item for every part of the military – army, navy, and air force. It should be remembered that the basic structure of the military uniform had not changed in any major way since the first dress regulations of 1903, but at the same time civilian clothing had moved on, the fit of men's clothing offered far greater comfort, the fabrics had improved and breeches had been out of fashion for a century. It was high time for the design of military uniforms to follow suit. A new type of battle dress was adopted, consisting of a blouse (Battle Dress – Drab Mixture) and trousers of the same description and sealed under Sealed Pattern Numbers Clo.375 and Clo.376 respectively, to be made up in sizes ranging from size four to size thirty four, a much wider range of sizes than had hitherto been produced. The Director of Ordnance Services requested that two hundred copies of the specification be provided, an indication that large-scale tenders for manufacturing contracts were about to be publicized.[9] It marked a turning point in the design of Australia's military uniform. It was a farewell to the uniform worn in the First World War.

The correspondence flowing in all directions following these design changes provides an insight into the plethora of clothing patterns affected. It would provide full-time work for clothing firms and the Clothing Factory, as well as members of the Ordnance Services and the Inspection Branch. The list below, taken from an Army Headquarters file, gives an indication of the garments affected during 1938 alone. The list shows the items that were subject to new specifications and made up as a sealed pattern:

Jackets, militia, blue or khaki
Jacket, khaki, drab mixture, 13/14 oz and 18 oz
Jacket, drill, khaki, P.F. [Permanent Forces]
Trousers, militia, blue or khaki
Trousers, drill, khaki, militia
Breeches, woollen, M.S. [Mounted Services]
Breeches, woollen, D.S. [Dismounted Services]
Shorts, drill, khaki
Caps, S.D. [Service Dress], khaki, Permanent Forces
Caps, forage, blue, militia
Cap, F.S., militia [Field Service]
Leggings, leather, brown
Capes, W.P. [Water Proof]

9. NAA: MP508/1, 61/716/91, Memorandum from Director of Ordnance Services to Chief Inspector, Munitions Supply, 28 August 1939.

Puggarees, Hat, khaki, with or without colour folds
Puttees, khaki, 3 yard
Shirts, flannel, silver grey, ordinary
Shirts, military, khaki, other ranks.[10]

These activities were stepped up even more in the latter part of the 1930s as Australia prepared for the eventuality of war. The army would be ready with improved uniforms and supplies.

Illustration 3 – New Uniforms for the Australian Army, Second World War

Left: Winter Dress – Second World War. Right: Summer Dress – Second World War. Photos taken by Author at the Bandiana Army Museum, Wodonga, Victoria.

The jackets still featured the four pockets, which had proven so useful during the First World War, but there were now two versions: a khaki drab woolen version for winter and a cotton drill version for summer. The buttons were oxidized and non-reflective, a lesson learnt during the Boer War in 1899-1901 when the Boers had been able to spot their opposite numbers as their buttons reflected in the bright sunlight. The trousers were long and closed-in at the bottom by anklets. Importantly, cotton uniforms were now an integral part of the uniform range. They were worn during summer and in tropical climates and also incorporated shorts. The importance of the Army's specifications for cotton uniforms was to have significant implications for the Australian economy as will be explained below.

Administrative Responsibility

Over the years, responsibility for military clothing and their inspection changed from one department to another and, quite possibly, records may have been mislaid or destroyed. The Clothing Factory was at first administered by the Board of Factory Administration, a

10. AA: MP508/1, 61/716/91, Correspondence between Ordnance Services and Chief Inspector, Munitions Supply Board, various dates during 1938.

branch of the Military Board. On the recommendation of the Royal Commission on Navy and Defence Administration in 1918, the factory came under the responsibility of the Board of Factory Administration, established on 1 September 1920, but less than a year later it was moved to the Munitions Supply Board, created on 13 August 1921. It was from the period of the Munitions Supply Board administration, headed by Arthur E. Leighton and with John K. Jensen as its secretary, that some of the more detailed correspondence on the system of sealed patterns and on inspection has remained intact. On 21 September 1939, ultimate responsibility for the Clothing Factory was moved once more, this time to the Department of Supply and Development and again, in 1942, to the Department of Supply and Shipping. But from about 1939, direct responsibility for the administration of the sealed patterns and inspection came under the Master-General of the Ordnance Branch. The historical progression in the administration since then is not clear, but it appears from correspondence in 1941 that the specifications for the garments were prepared by the Inspector-General of Munitions in the Inspections Branch of the Department of the Army.[11] By 1943, the Master-General of the Ordnance Branch under the Directorate of Supply and Clothing held responsibility and was, among other things, in charge of pattern design.[12] A 1945 document reveals that the pattern design was carried out by the Director of General Stores and Clothing, still under the Master-General of the Ordnance Branch.[13] In 1950, the Department of Supply and Shipping was re-structured to become the Department of Supply, which oversaw the Clothing Factory's operations until at least 1967. Further research is required to track the changes in responsibility since then. It is not clear whether the Clothing Factory was placed under the Department of Defence Production along with the munitions factories upon the creation of this department on 7 May 1982. However, it is known that the factory came under the umbrella of the Office of Defence Production at some date in the 1980s and was transferred for privatization from there to the newly incorporated Australian Defence Industries Pty. Ltd. on 4 May 1989.

Driving Innovation

The system of sealed patterns was frequently updated with new garment designs, better methods of manufacture, novel fabrics, and the latest research. It lent itself to become a vehicle for innovation and the Australian Government Clothing Factory was the crucial driving force for its implementation and for the dispersion of innovation among the private clothing firms. A 1964 report by John Allison and Leslie Brewster reflected upon the activities of the Clothing Factory as being "a laboratory for garment design and development."[14] It also became the driving force behind innovation in the private firms contracted by the Clothing Factory to manufacture uniforms. The specifications of the Sealed Patterns would dictate particular ways of sewing and would identify which part of a garment would require specific machines. In this way, a clothing firm interested in

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11. This is evident from NAA: MP508/1, 61/707/39, Department of Army [Cloth & Cord, vide 'Clothing & Materials'] - Uniforms for volunteer defence Corps [131 pages] [Box 99].
12. NAA: MP222/1, 13K, Camouflage - Individual Concealment - Uniforms and Equipment, Letter from the Engineer-in-Chief.
13. NAA: MP76/1, 18315, Inventor/Submitter -] J Burton - Improvement in Jungle Green Trousers.
14. NAA: A4940, C3567, Report from Sir John Allison and Mr. L. Brewster on Commonwealth Government Clothing Factory Requested in Letter from Minister for Supply dated 13th January 1964, p. 1.

tendering for a contract but without the necessary techniques or machinery would be obliged to introduce the required methods or new machinery in order to stand a chance of winning the tender. The result was that innovative techniques and investment in new sewing machinery trickled through the clothing sector.

The Interim Report of a 1951 Working Party chaired by C.K. Davies recognized the significance of the Clothing Factory in spreading innovation by the supply of samples and patterns to the private sector.[15] Not only did it enable private firms to supply large quantities of the Defence Department's demands, it also forced them to produce this in specified ways. The following illustrates one instance in which new technology specified in new Sealed Patterns was adopted by the private sector. On 17 April 1916, instructions were sent to the Senior Ordnance Officer of the Fourth Military District, Adelaide, regarding changes to the Sealed Patterns for jackets and trousers. The changes involved replacing higher-cost thread with cotton thread and replacing hand-sewn buttons with machine-sewn buttons. The effect of these particular changes was a reduction in the price of the jackets and trousers by 6d per dozen compared to the previous Sealed Pattern.[16] Sewing buttons onto garments by hand was slowly being replaced by the use of special button sewing machines, saving not only time but also the cost of labor. Contractors willing to manufacture to the new Sealed Patterns therefore had to have these machines in their establishment.

Wider Implications of the Sealed Pattern System for Innovation

The requirement to manufacture military garments to specification had repercussions beyond the operations of individual contractors – at times an entire industry was required to make new inroads into its production methods. In 1937 the industry was gearing-up for the possibility of involvement in another war, and particularly for the production of cotton garments suitable for tropical warfare. The Quartermaster-General had placed a London order for 100,000 yards of khaki cotton drill in November 1936, but the order was deferred as government policy made the sourcing of Australian supplies a matter of preference. At that time, the Australian cotton industry was still in its infancy. Tenders were invited by the Contract Board in New South Wales and Victoria, resulting in three submissions. The samples of the drill submitted by the tenderers were compared to the Sealed Patterns, which resulted in the following statement by the Secretary of the Contract Board on 9 April 1937:

> Though the Drills are not equal in quality to the Patterns, allowance might be made for the fact that they represent first attempts by local Mills to manufacture to our standard. A further factor is that same are of yarns made from Australian cotton whereas the cotton in the patterns is of American origin. There is a difference in these cottons which are the foundations of the materials, but I understand the local mills are representing the matter to the Queensland Cotton Board with a view to the American type being grown locally. It may reasonably be anticipated that some time will elapse before all the difficulties of local manufacture are overcome but it is considered that these samples are sufficiently

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15. NAA: A816, 14/301/486, Commonwealth Government Clothing Factory, C.K. Davies (Chair), Interim Report, p. 1.
16. AWM27: 382/7, Correspondence concerning the Manufacture of Military Clothing for the AIF, 1916.

> encouraging to believe that ultimately the local manufacturers will produce cotton goods suitable for Defence requirements.[17]

As this statement indicates, the Defence Department was placing pressure upon the local cotton industry to improve the quality of the cotton fiber and to mark the American type of cotton as the example to duplicate. This is a significant development and, as it turns out, proved to be a key stimulator in the growth of the Australian cotton industry. The demands by the department were based on the specifications for the Sealed Samples of cotton garments and set the scene for industrial development in Australia, just as the specifications to use machines to make buttonholes improved the clothing industry some twenty years before, as noted earlier. The situation in the Australian cotton industry at that time was somewhat confusing. There was as yet no clear strain of cotton that promised to comply with the military specifications. As Henzell points out,

> The chief deficiencies of the local fibre were its inadequate length and strength, and its excessive variability. One of the main reasons for the variability was varietal diversity. [...] a 'hopeless mixture of American, Brazilian, Egyptian and Sea Island varieties'.[18]

Not only was there pressure upon the cotton industry to change its production methods, the spinning and weaving mills producing the yarns and fabrics for military uniforms also had to keep up with technological changes or they would lose out on contracts.

The mill of Davies Coop & Co. Ltd. in Melbourne had obtained the contract for 50,000 yards of khaki drill and, in the hope of remaining a supplier to the Defence Department in the foreseeable future, had standardized a section of the mill for this particular cloth.[19] It was not unusual for mills or clothing manufacturers to reorganize their processes for the purpose of delivering the contracted goods, but at the same time it provides some insight into the influence that government contracts had on the operations of its contractors. An even clearer example of the willingness of companies to introduce new technology for the sake of obtaining government contracts is reflected in communication received from John Bentley & Sons Ltd. of Melbourne. The letter states that,

> This Company is prepared to treat any woven fabrics of its own or any other manufacturer's manufacture up to 56" in width and in any length desired to make them 'water repellent' by the 'vulcanising' process lately introduced by Imperial Chemical Industries Ltd. Woven fabrics such as drills, Bedford Cords, canvas, linen, overcoatings and woollen worsted or cotton woven fabrics may be successfully treated by this process.[20]

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17. NAA: B1535, 733/1/251, Drill Khaki Local Manufacture, Report from Secretary to the Contract Board, to the Minister, 9 April 1937, p. 3.

18. Ted Henzell, *Australian Agriculture: Its History and Challenges* (Collingwood, Victoria, 2007): 213, based on J.J. Basinsky, *Cotton Growing in Australia: An Agronomic Survey* (Canberra 1963): 27 and 103, and quoting W.H. Johnson, *Cotton and its Production* (London, 1926): 329.

19. NAA: B1535, 733/1/251, Letter from D.M. Davies, Managing Director of Davies Coop & Co. Ltd., to Secretary, Contracts Board, 19 August 1938.

20. NAA: B1535, 733/1/251, Memorandum from Secretary, Contract Board to Secretary, Military Board, 1 December 1938.

The firm of John Bentley & Sons Ltd. was evidently ready to invest heavily in new technology for the sake of obtaining Defence Department contracts for which this technology was specified, in this example the "vulcanizing" process to render garments water repellent. The quotation also underlines the links between the Defence Department and scientific experimentation: the Imperial Chemical Industries Ltd. (ICI) that had developed the 'vulcanizing' process was in close collaboration with the department and had also developed green dyes to color the "jungle green" fabrics.

Just as John Bentley & Sons were prepared to invest in new technology, the spinning and weaving mills also updated their machinery to keep production capability up to date and in line with Defence Department contract requirements. In the midst of the purchasing restrictions introduced by the government during the Second World War, the Ballarat Woollen and Worsted Company Ltd. applied for a permit so that the required plant could be manufactured in England. The permit was for two Gessner spinning frames and their spare parts for their new woolen spinning plant, on order from Messrs Asa Lees & Co. Ltd of the Soho Iron Works in Oldham, England, and for a double head Gill box plus two single head Gill boxes, and material to convert six Roving Frames and two Reducers with Eclipse Spindles and front rollers, on order from Messrs Prince, Smith & Stells of Keighley, England, to be used in the mill's new worsted plant to produce khaki cloth. All equipment was,

> [...]very necessary to replace old plant of over fifty years service, and we must have such renewals in this section of our mill if we are to adequately cope with the increasing National needs of Khaki Cloths and Blankets.[21]

The Defence Department requirements were driving large sections of the economy, from the woolen and cotton mills, to the clothing firms and even the cotton industry, and was driving it well into the future as far as new technology was concerned. But introducing new technologies was one aspect, delivering product at acceptable price levels and at high quality was another.

Cutting Costs– Clothing Factory and Contract Board Combine to Introduce New Cost Methods

Tenders, by their competitive nature, compelled contractors to produce at the lowest possible cost, but the production of military uniforms did not allow for a reduction in quality. The system of specifications, Sealed Patterns, and scrupulous inspection ensured high levels of quality control and operating efficiency in the industry in which the Clothing Factory played a crucial role. By the Second World War, the factory incorporated the office of the Chief Inspector of Stores and Clothing, which employed six men on a permanent basis who would calculate the cutting averages for each garment so that the exact amount of fabric required was known. Having these figures available facilitated the placement of fabric orders from the mills, assessing tenders, planning of future requirements and

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21. University of Melbourne Archives (UMA): The Ballarat Woollen and Worsted Company Ltd., Correspondence – Commonwealth of Australia Department of Defence, Army, Air, Supply & Development, From 14 February 1941 to 30 October 1941, Letters from the Manager, The Ballarat Woollen and Worsted Company Ltd, to Mr A.V. Smith, Contracts Branch, Department of Supply and Development, both dated 16 May 1941.

preparing government budget estimates. The Chief Inspector's office also started to produce miniature lays – illustrations of the most efficient way of laying pattern pieces onto fabric to minimize wastage.[22] This had never been done before in this way. The combination of providing cutting averages and miniature lays not only removed fabric waste as a factor in tendering costs and thus led to further government savings, the system educated the industry in more efficient ways of planning and costing.

Government control over the manufacturing of uniforms went even further than this. The Contract Board's Cost Accountant used certain average wage rates, other manufacturing costs and applied "reasonable" profit figures and was able to provide the board and thus the industry with fixed prices for each type of uniform garment. An example of the cost breakdown for a Service Dress Jacket as calculated by the Cost Accountant in 1943 is shown below.

Table 1– Contract Board Cost Breakdown to Determine Fixed Price of a Jacket, S.D.

Fixed Price of Jacket, S.D. (New Design), 1943	
Material: Department	£11: 8:11.77
Contractor	3.00
TOTAL MATERIAL	£11: 9: 1.77
Direct Labour	£2: 8: 1.80
Overhead	16: 1.60
MANUFACTURED COST	£14:13: 4.17
Profit	8: 9.61
Payroll Tax	1: 4.05
TOTAL	**£15: 3: 5.83**

Source: NAA: B4601/5, 78243 Part 1, Department of Supply and Shipping, Contract Board, Fixation of Prices of Uniform Clothing – General Policy File, Business Paper No. 2913.

Table 1 shows the cost breakdown for a Service Jacket in 1943. The exact length of material required to make the jacket was provided by the Inspector of Stores and Clothing and the cost of the cloth was already known, thanks to the Treasury-provided Trust Fund under which cloth was purchased. This cost amounted to £11 8s.11d. The contractor's cost of 3d was not further explained, but may have been his cost for additional notions, such as thread, buttons, trim etc. His total cloth cost therefore came to £11 9s.1d. To make up the garment, the Cost Accountant was using Federal Award wages in the clothing industry and estimates of hours of labor involved. The garment's labor costs were then calculated as £2 8s.1d. To this was added the factory's overhead costs (cost of running the machines

22. NAA: B4601/5, 78243 Part 1, Department of Supply and Shipping, Contract Board, Fixation of Prices of Uniform Clothing – General Policy File, Business Paper No. 1355, p. 2.

and other equipment, electricity, gas, administration costs etc.) during the hours of making the garment, so that the total manufacturing costs then came to £14 13s. 4d. In an effort to be as accurate as possible for a representation of costs and profits in a commercial enterprise, the Cost Accountant then calculated a "reasonable" profit of three percent, added the cost of payroll tax, and thus arrived at the figure of £15 3s.5d. as the price payable by the Defence Department for a Service Jacket in 1943.

This system of breaking down the manufacturing cost was applied to every garment, altering the relevant costs as appropriate, and these were presented in tables for use by the Contract Board to assess the private firms' budgets in their tender applications. The cost figures were frequently updated in line with changes in wage rates and other determinants.[23] If a private firm had an interest in supplying garments under contract, it had to ensure it could produce these at the same (or lower) cost as required by the department. The system drove the contractors to cut their own costs as far down as possible to make as much profit as possible, while selling the goods as the fixed prices determined by the department. This had the potential for using low cost labor where higher paid, skilled labor should be used. It had the potential to let unnecessary repairs or purchases be delayed. Whether or not this really happened under the fixed-price system may be a matter for future research. In any event, it was a system in which the Clothing Factory and the Contract Board exerted full control over all aspects of military uniform production. It prescribed the manner in which the uniforms were to be produced, the technology to be used and even the costs and profits to be made by the contractors.

Conclusions

The Clothing Factory was the originator and keeper of the IP inherent in the design of Australian Army uniforms. The IP administration entailed a detailed system of specifications and Sealed Patterns. As the Clothing Factory sub-contracted excess work to the private sector, it introduced quality control through strict inspection services, forced contractors to innovate by their purchasing of certain machines (such as button sewing machines) and their adoption of more efficient work processes in order to comply with contract conditions, and it educated the industry by introducing miniature lays to minimize fabric wastage.

The Contract Board had an influence on methods of cost accounting in the industry. By preparing detailed schedules of material, labor and overhead costs for each garment and imposing a certain percentage of profit, the industry was presented with fixed prices to which contractors were required to produce. The cost accounting system could easily have been adopted widely to calculate the price of any garment by any firm or person in the clothing sector, thus introducing a new level of certainty for profitability.

IP management of military garments had wider implications in Australia. The Clothing Factory's new uniform designs and specifications were instrumental in changing the production of certain raw materials, in particular cotton, and the type and quality of the fabrics used. Australian participation in the wars in the Asian and Pacific Theaters

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23. To determine the appropriate wage rates, Leslie Brewster, Acting Deputy Director of Contracts, carried out negotiations with the Clothing & Allied Trades Union, whose General Secretary-Treasurer at this time (1943) was A.R. Wallis. NAA: B4601/5, 78243, Part 1, Department of Supply and Shipping, Contract Board, Fixation of Prices of Uniform Clothing – General Policy File, Correspondence between L. Brewster and A.R. Wallis.

created heavy demand for locally produced cotton drill fabric and the Defence Department's requirements for cotton plant varieties of American origin formed a strong incentive for the Australian cotton growers to introduce these varieties. The military clothing specifications propelled many firms into investing in new textile technology for higher production efficiency and into producing military garments to pre-determined prices. It can be said that by the late 1930s all aspects of the production of military uniforms had become centrally controlled and had transformed the military clothing sector in more than one sense from a splintered industry to a uniform national industry.

Abbreviations

NAA National Archives of Australia
AWM Australian War Memorial
ABS Australian Bureau of Statistics
AIF Australian Imperial Force
UMA University of Melbourne Archives

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