

Bluechiip Limited (ASX: BCT)

SPECULATIVE BUY SHARE PRICE: \$0.06

COMPANY DATA Share Price (AUD/sh) 0.06 Issued Capital (M) 116.8 Market Capitalisation (AUDM) 7.0 Year High - Low (AUD/sh) 0.25 0.05 Cash Forecast (USDM) 0.0 Debt Forecast (USDM) 0.0 0.0% Gearing Forecast ND/E (%) Average Monthly Turnover (AUDM) 0.0 **BCT vs ASX 200 INDEX** - Index (Rescaled) Share Price (\$ps) 0.30 0.25 0.20 0.15 0.10 0.05 Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Jan 13 13 13 13 13 13 13 13 13 14 **PERFORMANCE 3M** 12M **1M** Absolute 0.0% -41.9% -74.3% Relative to ASX 200 0.0% -38.5% -74.9% **BOARD**

Iain Kirkwood	Executive Chairman
Joe Baini	Non-Executive Director
Ron Finkel	Non-Executive Director

MAJOR SHAREHOLDERS

Dr Stephen Wood	14.0%
lain Kirkwood	7.1%

ANALYST

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Bluechiip's patented MEMS ID technology enters commercialisation, setting a new standard in global wireless tracking.

KEY POINTS

- Tracking solution: Bluechiip (BCT) is the only company that produces MEMS technology based smart chip which provides temperature plus location chain-of-custody tracking of biospecimen samples.
- Temperature: Unlike traditional identification and tracking technology, Bluechiip's technology is also able to sense temperature. This has important applications in industries where temperature control and monitoring is critical.
- Operates in extreme conditions: Unlike its competitors, Bluechiip's products are unaffected by extreme cold or gamma irradiation.
- Chain of custody: The Bluechiip system grants user complete chain of custody control with the ability to track who, when and where any sample was accessed and in what temperature condition it was accessed in.
- Minimising manual handling: The wireless tracking ability of MEMS means that sample information can be accessed without physical contact, thereby reducing disturbance to sample's natural storage environment.
- Robust market outlook: The biobanking market, Bluechiip's
 initial focus, is highly robust. Growth has been strong over the
 past decade and is expected to continue to 2025. Future
 growth is expected to predominantly come from Asia, where
 an increasingly wealthy population will generate greater
 demand for health care.
- Market leader and intellectual property: Bluechiip is the only company which has applied cutting edge MEMS technology to a storage tracking application. Significant R&D has been committed to the technology and the Company holds a number of patents over its products.
- Commercialisation: The Company has revised its commercialisation strategy and is now focused on technology development and partnership to expand its market presence.



SUMMARY OPINION

We believe BCT's MEMS based smart chip products has genuine potential. In its first targeted market, Biobanking, MEMS is the way of the future. Where Bluechiip adds value is for newly established biobanks who want to implement a relatively low cost system which works out of the box. Bluechiip provides a fast and efficient way for small to medium biobanks who don't currently have a sophisticated system implemented, but whose customer value chain of custody control. We believe that the substantial reduction in pricing implemented recently has now brought BCT's products to be in line with its competitors. This should revitalise sales and assist BCT establish a market for its products. We rate BCT as a **SPECULATIVE BUY** with a very high risk profile. We see the near term catalysts being the installation of a new high quality management team and actual sale conversion from its marketing strategy.

COMPANY BACKGROUND

Bluechiip Limited (BCT) is an ASX listed technology company with an initial focus on the commercialisation of its micro electro-mechanical systems (MEMS) based smart chips. These smart chips provide a wireless tracking solution for storage of precious biological samples. In addition to tracking, BCT's smart chips also have temperature sensing capabilities. This is often critical for storage of precious biospecimens as variations in temperature can easily damage sample quality.

Whilst there are numerous potential applications for BCT's smart chip technology, the most immediate and lucrative market for BCT is in biobanking. Biobanking refers to the cold storage of precious human biospecimens such as stem cell, cord blood and other human tissues. As medical research and technology becomes developed, so has the demand grown for biobanks. As this growth continues, the ability to securely and efficiently manage large repositories of biospecimen samples will become increasingly important. This is where Bluechiip hopes its MEMS based products will differentiate itself by minimising handling error, facilitating a more efficient retrieval process and providing complete chain of custody control. BCT is the only company that can provide temperature chain-of-custody tracking.

Bluechiip's smart chip technology is a quantum leap compared with existing tracking system used in Biobanks. The technology may be a replacement or used alongside existing system such as labels and barcodes. Compared with labels and barcodes, the smart chip has several important advantages. These include not requiring a visible tag or line of sight to work, minimising physical contact to reduce the risk of sample contamination and reducing cataloguing error by automatically logging smart chip's location. A further advantage of the smart chip is that it's immune to extreme temperature environments and harsh radiation bombardment. Labels, barcode and even radio frequency identification (RFID) systems have issues in such environments.

Following almost a decade of R&D, BCT finally entered commercialisation in 2013 launching a range of storage devices embedded with the MEMS smart chip technology. Each device is specially designed to store different types of biospecimen samples. These devices can also be used in conjunction with one and another. In addition, BCT also sells the Bluechiip Matchbox™ reader, which wirelessly reads information from smart chipped devices as well as the Stream™ software, a web-based sample management application.

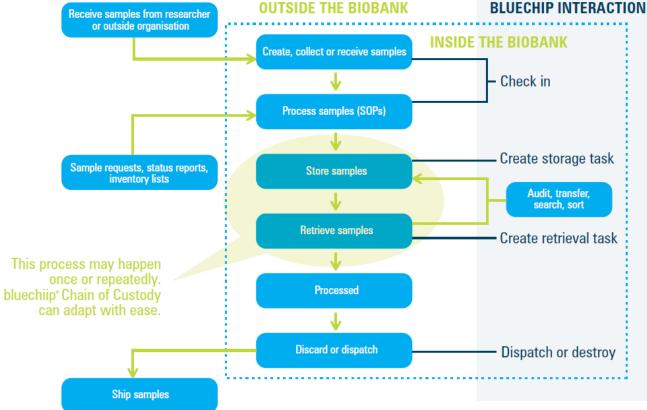
From a marketing perspective, the company is now fully focused on delivering commercial sales and bringing the company into profitability. Whilst the initial launch and subsequent sales in 2013 were muted, the company has nevertheless put in place a number of initiatives which should result in sales over time. Not the least of which is a drastic reduction in prices to be competitive with existing competitors as well as a refocus on technology development rather



than product development. Recognising the need to pursue a more aggressive sales strategy, the board has recently restructured the company's management team to place greater emphasis on its marketing and sales efforts.

Figure 1: Bluechiip's Chain of Custody system





KEY PERSONNEL

Iain Kirkwood - Executive Chairman

• Iain is an experienced consultant and holds professional directorships in both listed and unlisted public companies. He has considerable practical and operational experience gained from a successful financial career spanning 35 years in a range of industries including auditing, resources, manufacturing and latterly healthcare in Australia, Britain and the USA. Previously Iain held a range of senior financial and general management positions in Woodside Petroleum Ltd, Santos Ltd, Pilkington plc, F.H. Faulding & Co Ltd and Clinuvel Pharmaceuticals Limited. Iain is currently non-executive director of Vision Eye Institute Ltd (VEI) and is Chairman of Avexa Limited (AVX) and Chairman of MHM Metals Limited (MHM).



Dr Jason Chaffey - CEO

• Dr Chaffey is responsible for driving the technical development and innovation of the Bluechiip® technology and overseeing the commercialization of this technology. Dr Chaffey has been actively involved in MEMS technology, product development and engineering for over 15 years. During the course of his career, Dr Chaffey has had experience ranging from the commercialisation of MEMS, electronics, mechanical and software products. Dr Chaffey has had long experience of managing global R&D and manufacturing activities and currently manages a multidisciplinary development and manufacturing team for Bluechiip located in Australia, Malaysia, Europe and North America.

MEMS

Micro Electro Mechanical Systems technology or MEMS is the technology of very small and substantially mechanical devices made up of components in a 3D structure. MEMS devices typically range in size between 0.02mm to 1.0mm. They usually consist of a central data processing unit and several components that interact with the surroundings such as microsensors. MEMS devices can vary from relatively simple structures having no moving elements, to extremely complex electromechanical systems with multiple moving elements. The one main criterion of MEMS is that there are at least some elements of mechanical functionality. MEMS technology has been in development since the 1980s. Their main application in today's world includes sensors, actuators and in structures. Common MEMS devices include accelerometers used in air bag, motion sensor game consoles, inkjet printer heads and micro-mirrors used for digital projection displays. The functionality of BCT's smart chip is one of microsensors.

MEMS has been enjoying double digit annual growth over the past decade and this trend is expected to continue for the next decade. This includes 20% compound average annual growth in units and 13% growth in revenues, to become a \$21 billion market by 2017. The demand growth for MEMS technology is in part due to the growth of automotive industry as well as other everyday applications where MEMS sensors have become standard. Innovation in the fields of robotics, energy harvesting and healthcare are also key to driving future growth.

BIOBANKING MARKET

Biobanking is the initial target market for BCT. Biobanking refers to the collection, processing, storing and distribution of biospecimens and associated data. In essence, Biobanks are repositories where valuable biological samples are stored for later use. These biospecimens include but are not limited to tissues, cells, DNA, sperm, eggs and umbilical cord blood. A strong Biobanking platform is required to sustain continued advances in drug development and medical treatment research. As such, Biobanks are quickly becoming a major global industry as populations around the world become more affluent and the collective demand for better healthcare increases.

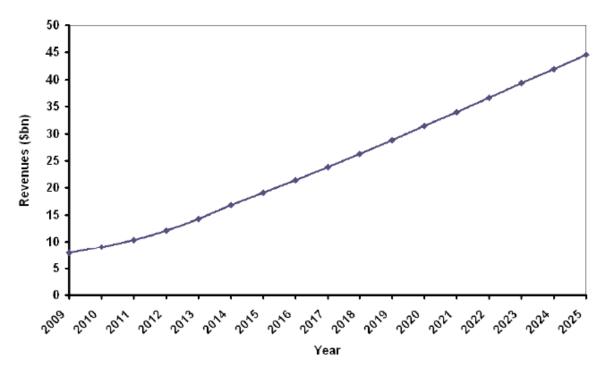
The global biobanking market is significant and is expected to see material growth to 2025. In 2009, the market for biobanking was estimated to be worth \$7.88bn. Total sales in this market are predicted to reach \$19.13bn in 2015, \$31.50bn in 2020 and \$44.59bn by 2025. Currently there are over 2 billion biospecimen samples stored in Biobanks globally. This number is also growing at a rapid pace at approximate 200m samples a year. The major growth areas are in Cord blood, IVF, personalized medicine, pharmacogenomics, regenerative medicine and stem cell therapies.



The surge in biobanking interest has also resulted from the preference to use biospecimens in pre-clinical pharmaceutical research as opposed to animal specimen. Amongst all the growth areas, human tissue stem cell and personalised medicine is expected to be the highest growth segments for the foreseeable future.

In the last few years, many governments around the world have also been actively setting up national biobanks. Over time, this will provide access to a wide range of biological samples for use in genetic research studies worldwide. This has come about as part of the growing awareness in society on the importance of medical research and development.

Figure 6: Biobanking revenue forecast



Further growth in the market beyond the next decade will largely depend on the success of R&D using biobanking resources as well as the development of innovative new therapies to treat illnesses. To a large extent, it will also be dependent on measures taken by organisations to meet the challenges arising from a lack of global standard for biobanking practices. Safe and efficient storage and retrieval systems are a mandatory prerequisite for biobanks which stores millions of samples in a multitude of storage devices. Challenges facing industry such as inefficient networking of existing centres, lack of coordinated tracking system and poor handling and cataloguing procedures can all leads hindrance in the growth of the sector. Chief among the all the challenges faced by the industry is the need to increase customer service. Given the precious and often limited nature of the biospecimens, customers always request samples be delivered and stored on time and with no damage.

COMPETITON

Traditional labelling and tracking technology employed in biobanking typically fall into one of the three categories, being Labels, Barcodes and RFID. Labels are arguably the most primitive logging system and usually refer to hand written or pre-printed paper labels. Whilst inexpensive, labels are inherently prone to transcription errors, falling off or even smudging. These shortcomings have been known to be a major source and handling error in biobanks. A number of



external research reports have quoted statistics on the level of mishandling in biobanks due to poor labelling practices. The industry has by in large started to shift away from labels in preference for Barcodes and RFID.

Barcode systems function as their name suggests. A significant amount of manual handling is still required for sample retrieval as scanners require a close line of sight to read barcodes. Further, barcode readings become unreliable in humidity or frost environments. This is problematic for biobanks as an increasing number of biospecimen such as stem cells and cord blood requires cold storage. As a matter of fact, many biospecimens quickly rise in temperature once removed from their cold storage environment. The longer they're removed, the more likely they are to suffer damage or degradation. Minimising manual handling is key to reducing this risk.

The biggest competition to BCT's smart chip technology is barcodes. RFID, technologically similar to BCT's smart chip, is commonly used and can be found in devices such as swipe cards, e-tags and animal microchips. Practically, RFID functions much as BCT's smart chip would. RFID tracking systems has already been implemented in a large number of biobanks around the world. As an example, Healthbridge, one of the largest IVF clinic operators in Australia has recently overhauled their tracking system to install RFID in all their clinics. However, RFID also is not without its limitations. Unlike MEMS, RFID is also not able to survive high temperatures of sterilisation or gamma irradiation. RFID also becomes inoperable in low temperatures below -80°C, which many cold storages often require. On the other hand BCT's smart chip suffers no such limitation and BCT's smart chip can operate in extreme temperatures ranging from -196°C to +60°C.

BCT's smart chip also has one additional feature which is the ability to sense temperature. Temperature tracking is critical to biobanking as it helps maintain sample integrity. As discussed before, given the fragile nature of biospecimens, even momentarily exposure to a wrong temperature could cause irreversible damage. The inability labels, barcodes and RFID to sense temperature means that means that potentially damaged samples could be stored as healthy ones without the knowledge of the biobanks.

Table 1: Comparison tracking devices

Company	Battery required?	Temperature range (°C)	Tag type
bluechiip	no	-196 → +60	Button
AeroScout	yes	-100 → +20	Card
Gentag	no	-80 → +200	Button
ThermAssureRF	yes	-80 → +150	Card
GAO RFID Inc	yes	-50 → +150	Card
TempTracker	no	0 → +120	Card
Adage RFID	no	-20 → +85	Button

Over 2013, Bluechiip's products have been priced at substantial premiums over its competitors. A cryovial for example is priced at \$2.50 each versus RFID enabled vials which usually costs around \$1.00 each. The pricing of BCT products have now been reduced to be in line with its competition, removing one of the biggest deterrents for potential customers on adopting BCT technology.



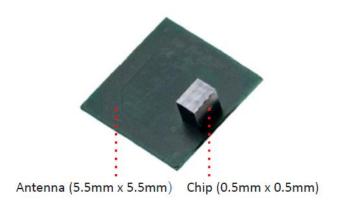
BLUECHIIP PRODUCTS

CRYOTAGS

The Cryotag is Bluechiip's flagship product. It is a miniaturised device which can be attached to storage devices used in cryogenic applications. The tag itself is made of a tiny microchip (smart chip) mounted on a small printed circuit board antenna. The smart chip contains Lorentz force resonators tuned to frequencies between 1.3MHz and 4.1MHz. As a mechanical device, the smart chip itself is passive and does not require power. When a signal from the Matchbox reader is received, the resonators in the chip are stimulated and return a signal indicating the unique ID and temperature of the tag. The stimulation is caused by electromagnet coupling which gives rise to the wireless and contact free feature. Each tag is pre-programmed during manufacturing with a unique ID.

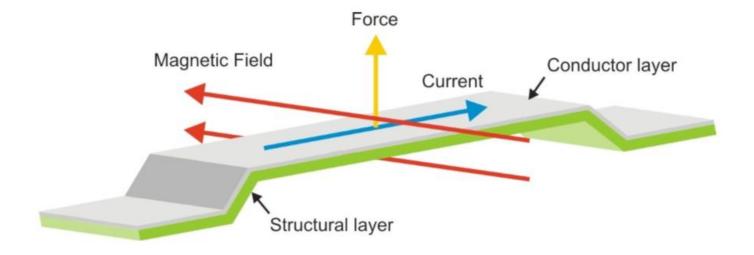
Figure 2: The Smart Chip





The layers in the smart chip are excited using a Lorentz force and resonance detection. Each layer is fabricated so that its resonance frequency differs from the others on a particular die. A particular frequency range will therefore generate a series of 1s and 0s which gives rise to the unique ID of each smart chip.

Figure 3: MEMS architecture





The smart chips are unaffected by extreme temperature variation or gamma radiation, benefits not available with current technologies. As such, cryotags can be re-sterilised via an autoclaving process or by gamma radiation without suffering any degradation. The longevity and reusability of the cryotag is one of its major draw cards over other tracking devices.

Each time the tag is used, an instantaneous temperature measurement is taken and time stamped. This allows for an accurate temperature history of the biospecimen to be recorded.

BCT's cryotags are also attached to the company's other storage devices including racks and towers. In addition, BCT's cryopreservation cassette, which is designed to hold blood bags, also has an embedded cryotag. The cassettes are lockable and have an anti-slip function making them considerably safer than conventional storage for blood plasma. All BCT storage devices can be used in conjunction with each other and can all interact with the Matchbox reader.

Figure 4: Bluechiip product range



MATCHBOX READER

The Matchbox reader is the device used to read both Cryovials and Cryotags. Cryovials are read in a special socket on top of Matchbox reader whereas cryotags on cassettes, racks and towers are read with the Retriever wand. The Retriever wand allows a user to determine a sample's location without disturbing the sample's thermal stability. The Matchbox reader records and tracks both the ID and temperature of the cryotags each time it's used and therefore establishes a chain of custody. Existing storage systems are unable to track who, when and in what temperature samples have been handled in the past. This leads to an internal control deficiency in terms of maintaining sample quality and difficulties in identifying samples that are damaged due to overexposure to heat. The manufacturing of the Matchbox reader is outsourced to Plexus Corporation, a US\$3 billion NASDAQ listed company.

In the last quarter, the Matchbox reader underwent its first product improvement by adding in a camera and other software upgrades. The reader is now able to scan barcodes as well thereby further increasing its versatility and allows biobanks with old barcode systems to gradually phase in BCT technology without the need to abolish its existing barcode system.



STREAM SOFTWARE

Stream is a web-based software which completes the BCT offering. It is integrated for use with the Matchbox reader and provides a database for information collected by the Matchbox reader. Stream assists users with tracking critical information such as time and date of sample access, retrieval and storage time, temperature measurements during transition periods and of course identity of individuals who accessed the samples.

A major update to Stream was also recently released, Stream 3.04. The update increases the flexibility of the sample management use of the Stream software.

MANUFACTURING

A key strategy for BCT has been to retain the flexibility of quickly ramping up production. To this end, BCT has chosen to outsource product manufacturing to third parties. This is prudent given the lack of MEMS manufacturing expertise locally. BCT maintains its core R&D in Australia whilst the fabrication undertaken by those with the technical expertise and economies of scale. BCT currently has a partnership with STMicroelectronics to manufacture its smart chips. STMicroelectronics is the world's largest MEMS foundry and had in excess of \$1 billion in MEMS revenue in 2012. It provides MEMS devices to household names such as Apple and Nintendo. The agreement with STMicroelectronics was entered into in September 2010 after BCT moved away from their old chip manufacturing partners IMT.

COMMERCIALISATION

Despite its current product focus, BCT is not a biobanking company. As a technology developer rather than a product seller, BCT's competitive advantage lies in delivering technological solutions to commercial partners so that they can leverage the MEMS chip technology to grow and protect market share. A refocus on this philosophy has led BCT to revise its commercialisation strategy. Under the new approach, substantially less capital commitment from BCT is required as product development would be largely funded by partners. Further, by aggressively seeking partners in multiple sectors, BCT is able to more quickly achieve external validation, access more paths to market and accelerate its speed to market.

It is expected that BCT will continue with its existing sales strategy in Biobanking given substantial capital already spent. Going forward in other markets, we expect to see much less end-product marketing from BCT and a greater focus on education of its technology platform. In terms of Biobanking, BCT has adopted a three tiered approach towards sales; Direct Sales, Early Adopter's Program and Distribution/Channel Partners.

In the last two years, BCT's sales team has been focused on directly targeting potential end users of its Cryo-range. Whilst no material contracts have been achieved to date, this is not unusual for start-up companies at the start of their commercialisation process. Currently, the company is in active discussion with a number of parties around the world who are expected to make initial orders in 2014.

BCT is selling a highly technical product to its initial market and is therefore required to adopt a technically focussed pitch to appeal to the sensibilities of its target customer base. A successful technical sell will need to convince customers that a switch to BCT's product will deliver marginal benefits which outweigh the status quo. BCT is actively developing technical information to assist the technical sale strategy which will complement existing product datasheets, and information from completed trials.



In addition, BCT is investigating the potential to brand its products under the name of market leaders to obtain credibility and visibility in the market place. This will potentially reduce the barrier to entry into the well established markets.

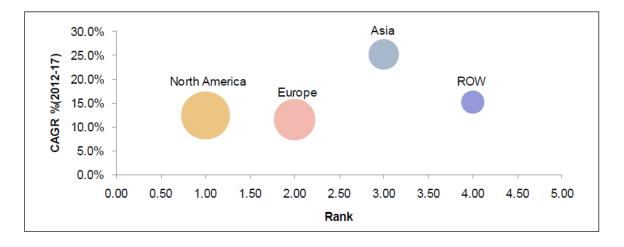
BCT's second sales strategy is the Early Adopter's Program (EAP). The EAP commenced in January 2013 and was designed to be completed in three stages. The first stage provided product feedback that was subsequently addressed in the pilot production batch. The second stage provided further feedback which addressed in the first full production batch. The third stage was intended to gather feedback relating to longer term storage and retrieval of biospecimens. The objectives of the EAP were four-fold:

- 1. Provide early user feedback that can be used to improve the Bluechiip System prior to commercial production.
- 2. Record and track real time ID and temperature of samples in research use only projects, biospecimen inventory management and bio-resource operational service support environment;
- Demonstrate Stream and Matchbox is overall system integration
- 4. Testing product functionality and performance

The program has been relatively successful with a number of unexpected issues identified and addressed. It has also contributed to the bulk of the commercial sales in 2013, approximately \$85k.

The third and final prong of BCT's sale strategy is to partner with distributors and channel partners in overseas markets. This strategy is important given BCT's future undoubtedly lies outside of Australia. On a global scale, the biobanking market in Australia in minuscule. In order for BCT to generate meaningful revenues, it must break into overseas markets . Over the past 12 months, the company has been aggressively pursuing this strategy and has been actively negotiating with a number of potential partners. With the America's large existing market and Asia's rapidly growing market, we expect to see BCT sign up a number distributors in both regions in the coming 12 months.

Figure 5: Bio-preservation sector growth by region



In the past 12 months, BCT signed up MiTeGen as a channel partner for its technology in the crystallography market. Crystallography is the science that examines the arrangement of atoms in solids and MiTeGen is one of the largest suppliers on cryopins in the world. Under the agreement MiTeGen has the exclusive right to sell Bluechiip technology enabled cryopins. The agreement with MiTeGen is a good example of gaining BCT entry into another market by leveraging off the presence of an established player.



In early 2013, BCT also signed up Micronic America, an industry leader in providing sample storage solutions, as its first distributor in North America. Under the agreement, Micronic has rights to distribute BCT's products throughout the United State and Canada.

Whilst we believe the distributor strategy is key to BCT's long term success, we're also supportive of BCT's methodical approach to choosing potential partners. BCT offers a niche product and going too wide too quickly could easily dilute the story.

In addition to the above, BCT is also exploring other commercialisation avenues such as forming strategic partnerships with route to market partners, entering into co-development and license agreements and entry into other markets by vertical integration.

The key partnerships BCT has entered into to date are listed in the table below:

Partner	Strategy
Micronic	Product Integration and distribution
OnQ	Australian Sales and Trials
Biospensa	Product Sales – Malaysia
LBD Life Sciences	Product Sales – China

Whilst the commercialisation strategy to date has not produced any meaningful sales, we recognise that 2013 has been a transitional year for the Company. Whilst there has been a lack of commercial success, the company has been able to lay the ground works for a more fruitful and sales driven 2014. Indeed, the recent departure of the Managing Director and Co-founder Brett Schwarz signifies that the company has now matured into the next phase of its life and that new leadership is required to drive sales aggressively.

VALUATION

We believe it is difficult to give a meaningful valuation for BCT in its current stage. Any valuation based on future cashflow would be unreliable and be entirely based on guesstimates of future sales. With BCT having just entered into the commercialisation phase, there are insufficient data to undertake such forecasts.

In essence, BCT's valuation outcome is binary. If the company was successful in converting meaningful sale orders in the near to medium term, then it is reasonable to expect such momentum to continue as success breeds success. Under such a scenario, BCT's valuation would be many multiples of its current share price. Alternatively, should sales not be forthcoming, then with its constrained cash balance, BCT would be forced to return to the equity markets to seek additional funding. Such a raising would likely be undertaken at a discount to the already depressed share price, causing further dilution existing shareholders.

BCT's immediate challenge is to source a management team with the ability to turbo charge sales efforts and convert orders. Whilst the pressure is on for the company to achieve this in the near term, we are cautiously optimistic that BCT will succeed given its strong core product. We see BCT as a significantly leveraged exposure to the growing medical technology industry with enormous potential upside.



RISKS

Ultimately, the key question facing BCT is whether it has sufficiently developed its products before entering into commercialisation. Whilst the current generation of BCT's product devices reduce much of the manual handling in sample storage, it does not completely eliminate it. Theoretically, with additional product development, this is possible to achieve. The dilemma is therefore deciding when along the development cycle is the right time to bring products to market. There is no doubt that the MEMS smart chip technology is superior to existing tracking systems. The question is whether it is sufficiently superior to convince biobanks to undertake the additional capex required to improve the overall control over their samples.

FORWARD PATH

The immediate focus for BCT will be to generate sufficient sales from its existing products to ensure the operations are on a breakeven basis. This is critical to establishing a foothold for its technology before attempting to break into new product markets. Going forward, assuming BCT finds success in Biobanking, the growth path for the Company remains exciting. There are a number of markets where BCT's MEMS technology would be effectively utilized to improve existing practices. Most of the opportunities are based on the unique benefits of the technologies and by the trends that are occurring in markets right now, namely chain-of-custody and the importance temperature monitoring. Some of the alternative markets for BCT are outlined below:

- Healthcare & Pharmaceutical potential application for a secure and unique identifier to be embedded into medical devices and consumables to allow for tracking and ensuring product authenticity.
- Cold Chain Logistics Bluechiip's technology can track the ID and temperature variation for items which must be transported in cold storage.
- Commercial and Retail Bluechiip's technology can be utilised to combat product counterfeiting. For example, each chip has a unique serial number, which permits mass-serialization and each unique serial number is factory programmed and locked (cannot be altered), providing tamper resistance.
- Industrial and Manufacturing Tracking for protein crystallography, high temperature tracking applications, structural health monitoring.



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