

EQUITIES

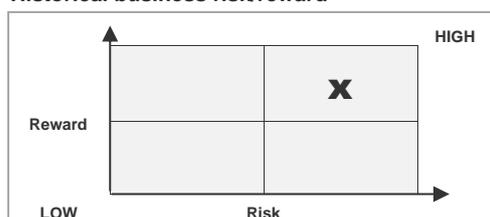
BRN-AU		Not rated
Stock price as of 14/03/2022 A\$		1.05
GICS sector	Information Technology	
Market cap	US\$m	1287
Avg Value Traded (3m)	US\$m	32.9
12m high/low	A\$	2.13 / 0.37
EV/Sales FY21	x	827.4
P/BV FY21	x	68.1

Historical financials

YE Dec (US\$m)	2019A	2020A	2021A
Revenue	0.08	0.12	1.59
% growth	-92%	60%	1,215%
EBITDA	(10.0)	(10.2)	(18.9)
% growth	30%	-2%	-86%
EPS (US\$)	(0.01)	(0.02)	(0.01)
% growth	42%	-84%	30%
EBIT Margin	-13,219%	-8,443%	-1,191%

Source: Company data, FactSet, March 2022

Historical business risk/reward*



*Relative to the market.
Source: Macquarie Research, March 2022

Style

Thematic
Growth
Value
Event

Source: Macquarie Research, March 2022

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MacVisit: Brainchip Inc Lunch with the board

Key points

- ▶ Since joining 6 months ago, BRN's new CEO Sean Hehir has been focused on commercialising BRN's technology.
- ▶ BRN is looking to create an ecosystem around their offering by collaborating with partners to derisk the value proposition of using their technology
- ▶ In the last few months BRN has signed 6 partnerships with both technical and channel partners

Macquarie hosted an investor briefing with BRN's directors and management.

Key takeaways

- **BRN in a nutshell:** BRN's IP is architecture for a neuromorphic design which is part of a SoC (system on chip). The functionality which BRN's adds is ability to process AI via hardware using materially less power vs. traditional chips.
- **BRN does not sell HW:** BRN's business model is the licensing of their IP to chip vendors and chip designers. The company only produces hardware as part of their validation process and for customers' commercial testing.
- **AI at the edge:** Use cases BRN sees for its IP are when 1.) there is a limited power to work with (e.g. battery powered devices) or 2.) where there is no internet connection. When there is an internet connection, BRN could at times perform better due to higher efficiency and faster reaction time (less latency). As BRN's IP does not need to send data to the cloud to process its AI it could also alleviate privacy concerns.
- **Focus on commercialisation:** Since joining, BRN's CEO has been focusing on the commercial aspect of the business from clarifying their positioning and business model to clearing up their marketing message – a whole new brand relaunch. Beyond targeting customers BRN is looking to build a partner network, creating an ecosystem by which to offer their IP.

Financials and risks

- **Cash burn:** management has called out an annual normalised cash burn run-rate of ~\$12m per annum with another \$5-6m for the design of a new chip, which they plan on doing in 2022.
- **Balance sheet:** As of 30 April 2022 BRN had US\$31m cash on hand. It has a further \$30m available in untapped facilities.

Latest developments

BRN's last 9 years have been focused on R&D and a modest attempt at commercialisation. This has changed with the entrance of the current CEO who joined ~6 months ago. Since then, BRN has shifted full focus on commercialisation. During the company's recent AGM, CEO and Chairman went through BRN's strategy of clarifying the company's positioning and business model, cleaning up its marketing message, and a whole new brand relaunch.

Management's view is that all enterprise technology can not operate in standalone – it needs to have relations in the market. BRN has embarked on an ecosystem development program. On 23 May 2022, BRN announced a partnership with ARM, and 6 weeks prior one with SiFive. Partnerships are being formed with technical, enablement and channel partners.

Fig 1 BRN partnerships



Source: Brainchip AGM PPT, May 2022

Business model

BRN's business model consists of four key elements

- Focus on Edge
- Sell IP
- Create partnerships
- Focus on sales & marketing

In prior years, BRN's clear focus was to create a chipset to validate what they were working on. Management has emphasised that BRN is NOT a chip manufacturer. BRN's licensees are the ones making the chips. BRN make some chips but only for the purpose of validating and showcasing their IP. BRN can provide a design kit for integrating neuromorphic capability onto chip licensee's SOC, but it does not sell hardware. What it sells are licenses to produce chips with its IP. What you get licensed from BRN is hardware silicon design in its base form. When you integrate BRN technology, the primary element is neuromorphic hardware.

A chipmaker's (e.g. NVIDIA, Broadcom etc.) chip will consist of their own design and IP, but in addition, will also have 3rd party IP which is purchased to be put on that chip. BRN is a piece of that equation. BRN's IP is a part of the whole chip design; they provide it as a standardised design, but a chipmaker can also tailor BRN's standard design if they would like to further optimise it for their own use case. BRN's IP adds low power AI processing capability to a chip. Existing processors can also run AI, but they consume a lot more power. BRN's neuromorphic design allows a chip to process more AI whilst consuming less power.

Fig 2 BRN's IP is a part of the whole chip design adding HW AI processing capability at low power



Source: Brainchip AGM PPT, May 2022

What does AI do? AI (artificial intelligence) inferences at the edge. It takes raw data, then says, "This is what I think it is" and using this inference takes actions at parts on the rest of the chip. BRN's chip does not just handle one use case of AI, it handles all cases. Anything that requires some type of sense or inference, BRN's chips can handle it, according to the company.

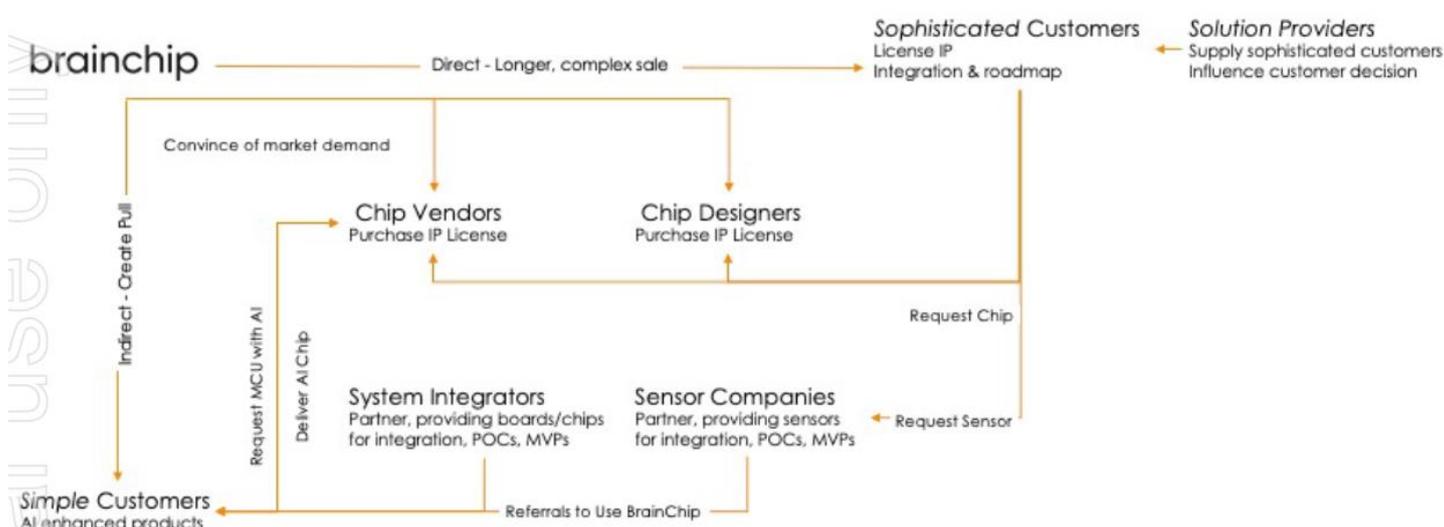
Use cases include autos, consumer electronics, communications, industrial, health etc. (anything that is looking to get smarter at the edge). BRN's value add is to have work be done in the local end-product without having to go through to a Data Centre for processing.

Sales model

BRN's sales motion will be based on a Push-Pull sales model. Key customers and intermediaries will be:

- Sophisticated customers (end customer - AI enablement)
- Simple customers (end customer - sell a license)
- Chip designers (help design for end customer, or create a design and look for end customer)
- Chip vendors

Fig 3 BRN's Customers and Ecosystem



Source: Brainchip AGM PPT, May 2022

Sales motion: BRN would talk to end customers and showcase the benefits of their technology, but it does NOT sell to the end customer. The end customer would then go to their chip and module suppliers and would ask them to contact BRN to purchase licenses to integrate BRN technology on the chips which go into their product. As part of selling IP, the key is not to sell just to who you are directly selling the licence to, but the end customer downstream.

Ecosystem build: Part of designing in tech is eliminating risk. It is expensive to create silicon and it requires a lot of investment. As a result purchasing BRN's IP standalone may seem a high-risk proposition to a client. What BRN is also working on is to create an ecosystem around their offering, hence the channel partners. By offering themselves as part of a package of IP which may have more familiar elements, it derisks the value proposition of using BRN. In management's view this is a big part of becoming an IP company. BRN's CEO stated: *No engineer gets fired for using ARM because it is the safest proposition you can use when designing an SOC. It is the defacto standard in microprocessor IP.* BRN is not competing with ARM (as ARM produces conventional chips vs. BRN producing neuromorphic chips) but BRN wants to follow the path ARM took with respect to how they established themselves as an IP player. BRN's is working on creating IP package bundles which demonstrate Brainchip's use cases under different industry verticals, showcasing the value that BRN can add to those industries. Licensees, in turn, can permeate the technology targeting companies in specific industry verticals.

Competition: In management's view, incumbent chip makers currently do not have an aligned approach. Intel has a bifurcated strategy. On one hand it has AI solutions using traditional processors, but at the same time it is working on a neuromorphic solution. According to BRN, it currently does not have one. BRN believes that its IP on neuromorphic design is defensible.

If competitors do not catch up, what is market opportunity in 2 years (in terms of revenue)? BRN is not talking about revenue goals right now. Key focii are: 1.) Number of licensees taking BRN's technology and royalties. 2.) ecosystem build (6 partnerships in last few months). Ecosystem build will involve building relationship depth, not just partnership breadth. Which will help increase market traction.

Financials

Staff: 25 engineers, ~15 people doing R&D work.

Cost: Board have authorised BRN to grow headcount by 40% this year. This will be sufficient for BRN to scale for next couple of years.

Balance sheet: BRN's CFO stated that the company's balance sheet is in good shape. In its most recent quarterly disclosure, BRN had \$31m cash on hand. BRN estimates in the current year it is running at a monthly operating cash burn rate of ~\$1m per month (including 40% uplift in headcount). On top of this, the cost of designing another chip this year will cost another ~\$5-6m (in total). BRN believes it has access to more capital if and when needed. The additional capital will be provided via the LDA facility (~\$30m left). BRN has expanded the facility a few times. LDA has offered to do more and BRN is still comfortable it can continue working with LDA if it needs to.

Views around raising new capital? BRN indicated it would consider raising capital. It will be dependant on the rate of growth and the opportunity. For some opportunities, LDA's financing facility may not be the right solution. Market opportunity will also play key role in the thought process. BRN will continue to focus on development, enhancing IP and its cadence of bringing on licensees as well as evolving its architecture and getting it to market. BRN expects the time to royalty to shrink to a 2–3-year period after licenses are signed based on management experience. If a licensee of customer looked for deeper integration of BRN's IP, which can be a costly process, BRN may need to look at strategic investment or other financing models.

Market opportunity

What are use cases for AI at the edge? BRN's technology comes into its own in a situation where no power supply or internet connection exists. Even when both are available, it becomes a performance conversation as BRN's IP is so much more efficient than traditional computing methods, according to the company. By processing AI locally rather than sending to the cloud and back, response times are also quicker and can also alleviate data privacy concerns. In other situations there will be occasions where you have a power envelope and traditional compute process which you apply to the solution will not fit in that envelope. BRN sees a huge opportunity from this. One of the opportunities management see is that AI typically drains the most power on a chip. By lowering the power usage of AI hardware, via BRN's offering, producers can materially lower the power envelope of a product which uses AI functions. BRN see neuromorphic design as the architectural revolution needed to produce low-power AI.

Barriers to greater growth:

- Customer education (customers do not know/believe neuromorphic till they see it)
- Design cycles for processors are being prolonged as people try to eek out as much as possible from current cycles. This could delay the switch towards neuromorphic enabled chips.

Most AI for traditional chips are written in CNN (convolutional neural networks- developed on tensorflow – leading industry framework). BRN uses SNN (spiking neural networks) which is the essence of neuromorphic. BRN has a software layer called MetaTF which converts CNN run thru MetaTF to convert to SNN and can work with a few keystrokes. Can tune up in SNN in hours not weeks.

Fig 4 BRN Quarterly cash flow report (from latest 4C release on ASX)

	US\$m
Receipts from customers	0.205
Payments for:	
R&D	-2.063
Product manufacturing and operating	-0.578
advertising and marketing	-0.834
staff costs	-0.802
admin and corporate costs	-1.017
Interest received	0.013
Income tax paid	-0.014
Government grants and tax incentives	0.035
Net cash (used in) operating activities	-5.055
Payments for:	
PP&E	-0.073
Net cash (used in) investing activities	-0.073
Proceeds from issues of equity securities	16.154
Proceeds from exercising of options	0.881
Transaction costs	-0.047
Other:	
Reduction in leases	-0.012
Funds received form shareholders on exercise of options	-0.019
Net cash from financing activities	16.957
FX	0.015
Cash at 31 Dec 2021	19.367
Cash at 31 March 2022	31.211

Source: Company data, Macquarie Research, May 2022

Fig 5 BrainChip Financial Summary

BrainChip (BRN)					Market Price: A\$1.00						
Interim		1H20	2H20	1H21	2H21	Full year	FY18	FY19	FY20	FY21	
Revenue	US\$m	0.0	0.1	0.8	0.8	Revenue	US\$m	0.9	0.1	0.1	1.6
Cost of revenue	US\$m	-	(0.0)	(0.1)	(0.1)	Cost of revenue	US\$m	-	-	(0.0)	(0.3)
Gross profit	US\$m	0.0	0.1	0.6	0.7	Gross Profit	US\$m	0.9	0.1	0.1	1.3
Other Income	US\$m	-	-	0.4	-	Other Income	US\$m	-	-	-	0.4
OPEX, net (incl. D&A)	US\$m	(6.2)	(5.0)	(9.5)	(11.8)	OPEX, net (incl. D&A)	US\$m	(17.6)	(11.0)	(11.2)	(21.2)
Operating loss	US\$m	(6.2)	(5.0)	(8.4)	(11.1)	Operating loss	US\$m	(16.7)	(10.9)	(11.2)	(19.5)
EBITDA	US\$m	(5.9)	(4.4)	(9.1)	(9.8)	EBITDA	US\$m	(14.4)	(10.0)	(10.2)	(18.9)
Total other income/(expense)	US\$m	(0.7)	(15.0)	(0.7)	(0.6)	Total other income/(expense)	US\$m	0.1	(0.4)	(15.7)	(1.3)
Loss before income taxes	US\$m	(6.9)	(20.0)	(9.1)	(11.7)	Loss before income taxes	US\$m	(16.5)	(11.3)	(26.8)	(20.8)
Tax (expense)/benefit	US\$m	-	-	(0.1)	(0.0)	Tax (expense)/benefit	US\$m	-	-	-	(0.2)
Net loss	US\$m	(6.9)	(20.0)	(9.3)	(11.7)	Net loss	US\$m	(16.5)	(11.3)	(26.8)	(21.0)
EPS/(LPS)	cps	(0.5)	(1.3)	(0.5)	(0.7)	EPS/(LPS)	cps	(1.6)	(1.0)	(1.8)	(1.2)
PER (reported)	x	nmf	nmf	nmf	nmf	PER (reported)	x	nmf	nmf	nmf	nmf
Profit and Loss Ratios		FY18	FY19	FY20	FY21	Cashflow Analysis	FY18	FY19	FY20	FY21	
Revenue growth	%	252%	(92%)	60%	1215%	EBITDA	US\$m	(14.4)	(10.0)	(10.2)	(18.9)
EBITDA growth	%	(16%)	30%	(2%)	(86%)	Change in working capital	US\$m	7.2	1.0	0.2	4.8
EV/Sales	x	1386.3	17390.1	10876.8	827.4	Operating cash flows	US\$m	(7.2)	(9.0)	(10.0)	(14.2)
EV/EBIT	x	-78.9	-120.3	-117.7	-67.3	Capex	US\$m	(1.2)	(0.2)	(0.0)	(0.3)
Balance Sheet Ratios		FY18	FY19	FY20	FY21	Other	US\$m	-	-	-	-
Net Debt/(Net Cash)	US\$m	(7.3)	(6.7)	(15.5)	(19.2)	Investing cashflows	US\$m	(1.2)	(0.2)	(0.0)	(0.3)
Net Debt/Equity	x	(0.8)	(0.7)	(0.9)	(1.0)	Receipts from the issue of shares	US\$m	-	7.4	2.0	-
Net Debt/EBITDA	x	0.5	0.7	1.5	1.0	Receipts from the exercise of unlisted o	US\$m	-	-	3.4	10.2
Interest cover (EBIT)	x	-	(20.6)	(39.4)	(675.0)	Other	US\$m	(0.0)	1.8	16.1	4.5
FFPOWA	m	1,006.9	1,187.2	1,527.5	1,719.2	Financing cash flows	US\$m	(0.0)	9.2	21.5	14.7
KPIs		FY18	FY19	FY20	FY21	Net Cashflow	US\$m	(8.5)	0.1	11.4	0.3
Product revenue	US\$m	0.108	0.010	0.030	0.196	Balance Sheet	FY18	FY19	FY20	FY21	
License revenue	US\$m	0.327	0.002	0.000	0.825	Cash	US\$m	8	8	19	19
Development service revenue	US\$m	0.513	0.063	0.091	0.567	Receivables	US\$m	0	1	1	1
Revenue from NA	US\$m	0.7	0.0	0.1	1.4	Financial asset	US\$m	-	-	1	-
Revenue from Oceania	US\$m	-	-	-	0.0	PP&E	US\$m	0	0	0	0
Revenue from EMEA	US\$m	0.2	0.1	0.0	0.2	Intangibles	US\$m	2	2	1	2
						Other	US\$m	0	0	0	1
						Total Assets	US\$m	10	11	23	24
						Payables	US\$m	1	0	1	1
						Deferred revenue	US\$m	-	-	0	1
						Debt	US\$m	0	1	4	0
						Defined benefit plan	US\$m	0	0	0	0
						Other	US\$m	0	0	1	2
						Total Liabilities	US\$m	1	2	6	5
Current price	A\$	1.00				Shareholders Funds	US\$m	9	9	17	19
Market cap	US\$m	1287				Other	US\$m	-	-	-	-
Enterprise value	US\$m	1314				Shareholder Equity	US\$m	9	9	17	19

Source: Company data, Macquarie Research, May 2022

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Recommendation definitions	Volatility index definition*	Financial definitions		
<p>Macquarie – Asia and USA Outperform – expected return >10% Neutral – expected return from -10% to +10% Underperform – expected return <-10%</p> <p>Macquarie – Australia/New Zealand Outperform – expected return >10% Neutral – expected return from 0% to 10% Underperform – expected return <0%</p> <p>Note: expected return is reflective of a Medium Volatility stock and should be assumed to adjust proportionately with volatility risk</p>	<p>This is calculated from the volatility of historical price movements.</p> <p>Very high–highest risk – Stock should be expected to move up or down 60–100% in a year – investors should be aware this stock is highly speculative.</p> <p>High – stock should be expected to move up or down at least 40–60% in a year – investors should be aware this stock could be speculative.</p> <p>Medium – stock should be expected to move up or down at least 30–40% in a year.</p> <p>Low–medium – stock should be expected to move up or down at least 25–30% in a year.</p> <p>Low – stock should be expected to move up or down at least 15–25% in a year. * Applicable to select stocks in Asia/Australia/NZ</p> <p>Recommendations – 12 months Note: Quant recommendations may differ from Fundamental Analyst recommendations</p>	<p>All "Adjusted" data items have had the following adjustments made: Added back: goodwill amortisation, provision for catastrophe reserves, IFRS derivatives & hedging, IFRS impairments & IFRS interest expense Excluded: non recurring items, asset revals, property revals, appraisal value uplift, preference dividends & minority interests</p> <p>EPS = adjusted net profit / efpowa* ROA = adjusted ebit / average total assets ROA Banks/Insurance = adjusted net profit / average total assets ROE = adjusted net profit / average shareholders funds Gross cashflow = adjusted net profit + depreciation *equivalent fully paid ordinary weighted average number of shares</p> <p>All Reported numbers for Australian/NZ listed stocks are modelled under IFRS (International Financial Reporting Standards).</p>		
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	AU/NZ	Asia	USA	
Outperform	63.27%	69.10%	79.79%	(for global coverage by Macquarie, 6.23% of stocks followed are investment banking clients)
Neutral	30.61%	20.65%	18.09%	(for global coverage by Macquarie, 3.33% of stocks followed are investment banking clients)
Underperform	6.12%	10.25%	2.13%	(for global coverage by Macquarie, 1.16% of stocks followed are investment banking clients)

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