# RealVR – The Next Really Big Thing

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## INTRODUCTION

A convergence of advanced information and communications technologies, linking the real and the virtual worlds in ways we have never experienced, is laying a foundation for a vibrant, multi-trillion dollar technology ecosystem that we are calling "RealVR." There are many information and communications technologies that have been developed, or are in development, that will shape a new technological ecosystem. Precursors in the development of RealVR today resemble those in the early 1990s that presaged the dramatic build out of the Internet and World Wide Web. It is very easy to be enthusiastic about the opportunities associated with RealVR. Indeed, many technology companies are looking to establish a dominant presence in RealVR, having already envisioned the tremendous potential associated with it. We believe there will be an important role for recognized players in RealVR, but we also see a role for entrepreneurs and smaller companies reminiscent of what we witnessed in the 1990s.

**In the movie The Matrix, simulations are so good you can't tell if you're in one. In a universe run on bits, everything is a simulation.**
**-- Kevin Kelly**

We are using the term RealVR to denote the convergence of the real world with the virtual worlds being created by advanced information and communications technologies. Other labels that have been used to describe this convergence include "The Metaverse[1]," "Augmented Reality[2]," "Virtual Reality," "3D Internet," and "3D Web." In the years ahead, we believe it will become increasingly difficult to distinguish between what's real and what's virtual. You can easily discern this trend by looking at the progression of software releases from Electronic Arts (ERTS) over the past five years. The exponential growth in computer power has allowed programmers to render life-like figures and action in a virtual environment. More powerful computers in the years ahead will allow software designers to replicate the real world in-silco. The social and economic implications of this are staggering.

The current set of core interface technologies we use today date all the way back to the time when Intel was formed. We've added features and richness, improved robustness and performance, but fundamentally even the current "state of the art" browsers and OS interfaces were innovations in the mid-1960s. The fact that most interaction still involves something as primitive as a keyboard and a mouse is testament to our predicament. A number of recent innovations including cameras, location technologies, multi-touch interfaces, 3D representations, and the use of gestures and voice are the first signs that we are finally close to witnessing some profound changes.

We believe RealVR is the next evolutionary phase of the Internet and World Wide Web. It promises to unleash a powerful dynamic in the global economy and fundamentally transform the way we live, work and play. Put simply, we think RealVR is the next really big thing. For public market investors who think that RealVR sounds "too far out" to be meaningful, we note that these trends are already showing up in the businesses of Apple (AAPL), Adobe (ADBE) and Nvidia (NVDA) while capturing quite a bit of attention at Intel (INTC), IBM (IBM), Google (GOOG), and Cisco (CSCO). Like many large technology shifts that appear to happen "all of a sudden," this one as been in the active development stage for some time already.

**What's Inside:**

**Déjà vu All Over Again**
**Opportunities & Challenges**
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**Future Report Topics**

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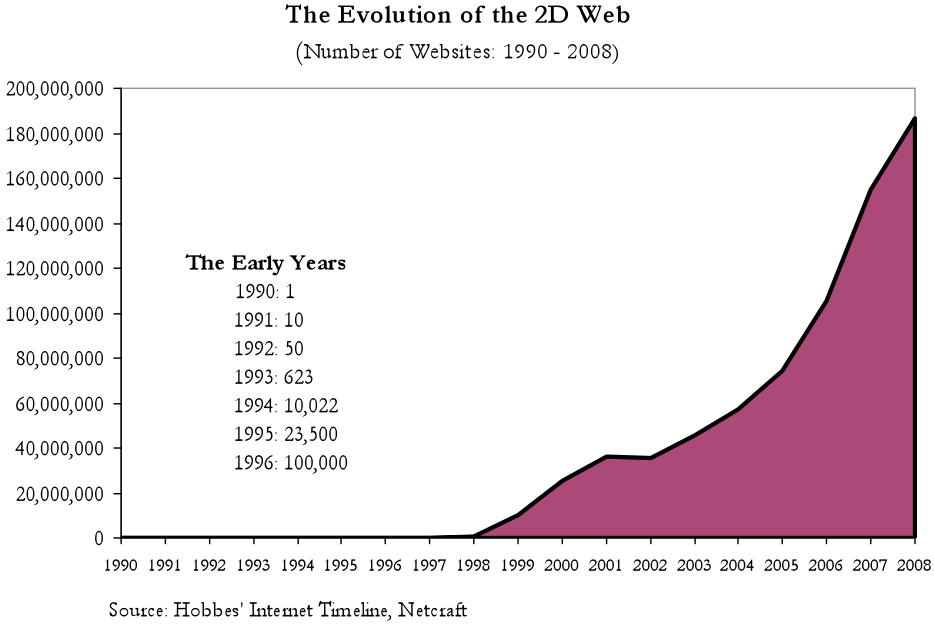
[1] The Metaverse Roadmap: Pathways to the 3D Web is a good resource. http://www.metaverseroadmap.org
[2] For a great introduction to automated reality watch the 2009 TED video demonstration of the MIT "Sixth Sense." http://www.ted.com/index.php/pattie_maes_demos_the_sixth_sense.html

## DÉJÀ VU ALL OVER AGAIN

When we look out at the technology landscape today, we can see the precursors of the next generation of the Internet/Web. The trends are reminiscent of the early 1990s, prior to the launch of the 2D Web. We don't know how fast the 3D Web will evolve in the future, but we can say with a great deal of confidence that the evolution of the 3D Web will be much like the 2D Web in the sense that it will evolve in an exponential – that is, non-linear – fashion. As Raymond Kurzweil observed in his book, *The Singularity is Near*, the evolutionary process of technology improves capacities in an exponential fashion. Innovators seek to improve capabilities by multiplies. Innovation is multiplicative, not additive. Technology, like any evolutionary process, builds on itself.

If you trace out an exponential curve over some period of time, measured in years, you will notice that the curve resembles a flat line in the early years. During this period of evolution, it looks like there is very little growth. As we progress in time, the curve begins to slope upward. At some point in time, we encounter the knee of the curve. This is the point where growth accelerates and we witness explosive changes.

In the graph below we show the evolution of the 2D Web by plotting the number of websites over time. From the chart, we can see clearly the classic characteristics of exponential growth. In the early years of the 2D Web, growth in the number of websites looks like a flat line. Of course, the Web is growing explosively during this time, but this cannot be discerned in the graph.




The insert in the graph above shows the evolution of the 2D Web in the early years. As you can see, the early years were marked by explosive growth from a very small base. It took six years for the 2D Web to grow to 100,000 sites, which is a milestone in Web history. The number of websites continued to grow rapidly in the late 1990s after we hit the knee of the curve. There was a slight pause in the number of websites after the Internet bubble burst. From 2003 onwards, the growth in the number of 2D websites has been impressive, rising from 35.5 million to nearly 190 million at the end of last year.

So where are we today with respect to the 3D Web? It is clear that we are in the very early stages of exponential growth. Where we are today resembles where we were with the first generation Internet/Web in the early 1990s, prior to the release of the Mosaic web browser. If you recall, during this time, few people knew what the Internet and the World Wide Web were, let alone used them. The buzz around RealVR and the 3D Web has certainly increased over the past year, but there is still very little activity.

The key question is when will the 3D Web take off? Nobody really knows, but we can see similar precursors to the 2D Web. It took a convergence of technologies in the mid-1990s to commercialize the Net and the Web. If we look at the RealVR landscape today, we can see the building blocks coming into place that will provide a solid foundation for exponential growth in coming years. Indeed, on the hardware side of things, the majority of computers can now handle 3D graphics. Even super light weight laptops have the video card capabilities and the processing power to render virtual worlds. On the software side, we have the increasing popularity of social networks, which indicates that more and more people are using the Web as a primary means to interact and communicate. We are past the tipping point of mass acceptance for social interaction over the Web. The stage is set now to move toward providing users with richer and more engaging environments, which is ideally suited to RealVR. Increasingly, we are seeing entertainment in 3D formats (e.g., video games, virtual worlds, and movies). These 3D environments are laying the foundation to make users more comfortable with navigating and interacting in a RealVR environment.

Obviously, the dynamics of the build-out of the 3D Web will be different than the 2D Web, but we should expect to see many similarities. As Mark Twain once said, "history doesn't repeat itself, but it does rhyme."

**OPPORTUNITIES AND CHALLENGES GALORE**

Such a major industry shift will have an impact on all existing players, but will clearly create new opportunities for emerging companies. RealVR creates opportunities not just in the core technology and well-known areas like gaming and collaboration, but also in an array of vertical applications like healthcare and retail. To be sure, there are challenges on the near term horizon, both technical and economic. But we believe the opportunities to innovate are as great today as they were in the early 1990s – perhaps even greater given the penetration of the Internet and Web in the global economy.

Many of the premier technology companies are taking a keen interest in RealVR. The established companies will undoubtedly play a prominent role as the RealVR space evolves. Deep pockets will be required to help fund the research and development necessary to build out the next generation Web, and collaboration among the various companies will be required to fuel innovation and growth. IBM sees major opportunities in this space and has been pursuing it now for a few years. Cisco has made it clear that telepresence is the key to replacing physical meetings and enabling a new class of collaborative applications. The list goes on to include companies like Intel and Apple. They all have billions of dollars to invest in this area.

There will, of course, also be an important role for smaller firms and new entrants into the market. These companies are not encumbered by bureaucratic inertia and can move quickly to create and occupy new niches that will crop up in the RealVR space.

**A key issue for smaller firms may be continued access to capital if the major firms continue to invest heavily. There will be a flood of opportunities but if capital is constrained they will be hard to realize.**

The key issue for the smaller companies in the RealVR space in the near term will be access to capital. Adventurous capital markets and access to opportunity-focused, long-term capital facilitated the build-out of the 2D Web. We could see a return to such markets in coming years, but access to equity capital through the public markets is likely to be restricted in the near term. Restricted access to capital should give the established tech companies a temporary competitive advantage against smaller rivals and possibly afford them a major advantage. Suffice it to say that the RealVR ecosystem will be a very diverse place, as we illustrate and discuss further.

In the remainder of this research note, we attempt to identify the emerging technology landscape associated with RealVR and assess the near term and longer-term opportunities for companies, as well as the challenges that lie ahead. We look forward to collaborating with clients, entrepreneurs, investors, and companies in the RealVR space in the future.

## REAL VR APPLICATIONS: MORE THAN SECOND LIFE

When you mention the words RealVR, Metaverse or 3D Web, many people think of Second Life. Second Life is a 3D virtual world, created by Linden Lab back in 1999, where users can socialize, connect and create using voice and text chat. It contains some of the powerful dynamics that can be generated by a 3D virtual world that are not present in a 2D world. As a pioneer, Linden Lab has blazed a trail and has a few arrows in their back to prove it. Immature technology, security problems, lack of real purpose and applications all contributed to a view of Second Life being a waste of time. (None of us waste any time on the 2D Internet, right?) Linden Lab continues to innovate with the launch of the Second Life Grid, which allows organizations to build their own RealVR system to be used in building real applications. IBM is on record with a case study where they used the technology internally to save big on internal meetings.[3]

Demographically Second Life isn't where much of the action is today. Second Life is positioned in the adult or over-30 segment. There are already scores of online virtual worlds that cover different age ranges and interest segments. Some are growing to be fairly large like Star Doll for girls (28M registered users), Habbo Hotel (over 100M avatars created and 8M unique visitors per month across 32 online communities) and IMVU (20M registered users with about 600K active monthly) which is a sort of 3D chat client with virtual goods. We expect the number of these communities will expand into the thousands in the next 24 months while the number of users in many will continue to grow. Although the public communities will be noticed the most, private and corporate versions may lead in terms of numbers.

Another early RealVR application that may hit close to home is Webkinz. Ganz created a mega-hit with their Webkinz product, a stuffed animal that comes alive online. The real stuffed animal at the store is recreated virtually online and children can interact with their Webkinz in both the real world and the virtual world created by Ganz. What's interesting and illustrative about Webkinz is that the experience exists in both real and virtual worlds. This is a pretty fair conceptual prototype for future RealVR applications in this category. Sites like Barbie Girls, Neopets, and Buildabearville have all followed on this success.[4]

Games are an obvious area for exploitation in the RealVR space. [So is porn but we are leaving that outside of our purview.] There are two converging areas in the gaming space to consider. One is fairly simple which is the exploitation of the power in computing and visual processing to produce new versions of games that are stunning in their closeness to real conditions in sports or on the battlefield. The other is the evolution of massively, multiplayer, online games of which World of Warcraft is the most famous, with over 11.5 million monthly subscribers. One aspect investors like about these games is the immense profitability that can be had once a community forms around a game. Even something as technologically mundane as fantasy league sports is a huge profit center for companies like Yahoo.

All these applications are supporting the rise of virtual goods and services. Investors have seen the opportunity already and put nearly $600M into such companies in 2008. Major VC firms like Accel Partners, Index Ventures, Globespan, SoftBank, Kleiner Perkins, Union Square Ventures, Sequoia, Wellington, Greylock, and Intel Capital to name a few have all funded companies in the space. Jeff Bezos has funded two and even Time Warner made an investment in Gaia Interactive.[5] The trends in virtual goods are very positive with community members routinely making small purchases in these environments. The economics are compelling. In a large community of 50M users a spend rate of just $1 per month yields fairly dramatic revenues and profits since the "goods" are just a small packet of bits. It even beats a printing press.

**With $600M of new venture investments flowing in and around this space in 2008 and estimated total revenues of over $1B in 2009, the sector is already showing signs of entering the mainstream.**

[3] A download of the IBM case study in pdf format is available at http://secondlifegrid.net/ at the time this is written.
[4] Numbers are a little suspect in this space but KZERO offers pretty good resources at http://www.kzero.co.uk
[5] A full listing can be found here: http://www.virtualworldsmanagement.com/2008/full.html

RealVR is a game changer in our view. Interactions will skyrocket as the world migrates to a 3D Web. The number and richness of interactions will expand exponentially, or even super-exponentially, in a RealVR world. There are over 1.5 billion people using the Internet currently, and the number of interactions taking place daily on the Web is huge and growing. Richer interactions that include video and human contact are leading the growth. The user populations on some of the leading services have grown dramatically: YouTube with 363 million, Facebook at 236 million and Skype at 405 million. Relative newcomer Twitter is not a rich experience but it is about networking and its growth has been astounding as well. We can expect the number of Internet users to continue to grow in the years ahead, given that global penetration is still low.

What is exciting about 3D is the potential for the new technologies to dramatically increase the penetration and growth of social and professional activity that involves interactions. The RealVR world is essentially social in nature. The recent growth in social networking has been breathtaking but is likely to be dwarfed by what we will see in a RealVR world. As RealVR evolves in the months and years ahead, it's hard to imagine what will not be transformed by the migration from 2D to 3D.

**Corporate collaboration applications will be a big driver of internal enterprise adoption, vertical applications will drive B2B adoption.**

The interactions created by RealVR promises to unleash a powerful, new dynamic into the global economy. Even at this early stage we estimate that over $1B in direct revenues will be generated this year by the companies on the map today. The potential for business transactions will be much greater as traditional business in other industry segments and verticals "cross over" into the virtual space. Companies will be able to engage customers and potential customers in ways never before possible. It is difficult to overestimate the power of engagement and it will be far easier and more profound to engage in a RealVR world than it is today in a 2D environment.

With great potential will also come some serious hurdles and obstacles. Privacy and security is already reaching a boiling point on the 2D web thanks to the success of applications like Facebook. But that's just the beginning. With RealVR our identity will be even more important since it will, in fact, be us in many meaningful environments and context. There are also some new problems. What about when someone uses a program or "bot" to drive their virtual presence instead of actually controlling it themselves? We already see this in Twitter where many become suspicious of others if their posts look too "bot like." There are services that will automate game play in World of Warcraft that have some up in arms. So the identity and authentication issues in RealVR get more important and more complicated at the same time. Friendships and relationships established in the virtual world can spill over into the physical world and vice versa. This creates new scenarios that blur the line between work and play, home and hobby, friends and family.

**There's a nest of technical (privacy, identity) and legal (trademark, patents and copyright) issues that will need to be addressed.**

Myriad legal issues are also cropping up in the 3D world. Trademarks enter a gray area. There's no problem with me wearing my Rolex watch and showing it to my friends, but what if I feature it prominently in my avatar or online space? Do I own that right? There are quite a few patents that still need to be sorted out to make sure someone won't be due a royalty every time people chat in a virtual space. Similar thorny issues exist in copyright law, terms of use, and most areas of real world law.[6]

Solutions to these problems will continue to develop. We can envision people having a set of identities in the RealVR space as individuals exercise control over these different interactions and activities. Avatars are already a big part of many virtual environments and are only becoming more so as the virtual worlds develop more realistically. Obviously, there will be important trust and identity-related issues associated with RealVR, just as there are today with the 2D Web. Avatars and all the issues related to them – their identities, appearance, functionality, etc. - will be big business in the future. Right now it is the frontier of research and innovation.

[6] Many of these ideas were helped along by the work of Benjamin Joffe at http://www.plus8star.com

## INVESTMENT STRATEGY

If RealVR were a game of Texas hold 'em, we would be anteing up and looking to go all in when the time is appropriate. We believe that now is the time for investors to formulate an investment strategy in the RealVR space that can offer strong relative and absolute returns in the short run, and provide for some out-sized triple-digit returns when we begin to experience explosive, exponential growth. As we said earlier, it is difficult to think of an area that will not be impacted by RealVR as it evolves. We will be publishing reports in the months ahead to help investors and companies navigate the RealVR space. There will be no shortage of opportunities and challenges in the future with RealVR. We're putting our chips on the table.

**It's time to do the work and begin to implement a portfolio strategy in this space.**

Ultimately RealVR will represent one of those "rising tides that lifts all boats" in the technology segment. But in the meantime there are some leadership names that can be approached while investors formulate a more complete investment strategy for the sector. Companies like Nvidia[7] and Adobe are two existing franchises that are now sitting closest to the changes we see happening. At the same time we can expect companies like Apple, Dassault Systems, Electronic Arts, Google, Intel, and Cisco to be aggressive in this area as well. Going beyond the obvious, we know that new interface technologies will drive growth for firms like Synaptics (touch) and Nuance (speech.)

## THE REALVR ECOSYSTEM

RealVR is going to have a profound impact on many areas. There will be a broad range of technology companies in our ecosystem, but there will also be many in entertainment and community. We fully expect that clusters of companies will spring up in key verticals like healthcare, retail and defense. New interface technologies will mean that we will no longer be using keyboards and text as primary I/O methods. Multi-touch screens, gestures, sensors, visual and vocal I/O will be more the rule than the exception. The networking and processing infrastructure will need to be scaled up by one to two orders of magnitude to handle the transport and computing needs of the software. Software, of course, will be much more sophisticated than the mostly 2D and transactional software we live with today.

We've put together an initial ecosystem of public companies in the RealVR space and included a snapshot at the end of this report. The spreadsheet will be updated and published quarterly and available online at our website. More companies, particularly foreign listings and private companies are being added.

## FUTURE REPORT TOPICS

We've taken the time to layout out some selected plans for preliminary research and publishing for the sector. This highlights the expansive opportunity that RealVR represents, but also helps to attract participation from our network to work with us on some that are in their core interest areas.

- RealVR killer applications in collaboration. We start with telepresence but expand into collaborative spaces, rich social environments and war rooms. Connections, cameras and bandwidth can combine with a little application software to enable highly productive environments that are as good as, or better than their real counterparts.

- Games get real. Virtual games get closer to reality and real games like paintball become popular in virtual formats. We also cross the fine line to applications in training and education, which can leverage the same technology and capabilities. How will this change the massive sports industry?

- Crossing the real/virtual boundary. How complex objects make it back and forth and what happens when they do? The technology exists today to easily move real objects into the virtual space. The

[7] See "Nvidia: Transition = Opportunity" published January 21, 2009. Available online in our research library.

converse is increasingly true as well. Companies like Dassault Systems sit in the middle of this emerging space.

- When do real stores go virtual? The answer: It already is so. Clearly, virtual goods are sold this way. But what about future versions of a device like the Kindle? Book purchases occur but no former chunk of tree pulp moves anywhere. Lawnmowers and tractors will be sold this way too. Obviously a physical good still needs to be shipped but browsing, research, interaction with sales and pre-sales staff will happen in virtual space. You'll configure your choice and pay for it just like in a showroom but it will be virtual. Real people will be behind the avatars. Your tractor will be delivered on a truck as it is today.

- How will RealVR impact healthcare? This is perhaps the most compelling area of all. Today we already have expertise being delivered over the network. Most radiologists are now overseas and helping to diagnose patients by looking at digital scans sent to them. Studies have shown that artificial environments are actually less stressful and overall better for patients, even when they are in an actual hospital. Many types of operations are already performed by advanced robotic machinery under the control of a surgeon. Today they are in the same room, but this limit is only artificial. Doctor visits and diagnostics will routinely be done online rather than in offices.

Clearly we have our work cut out for us; at least for the balance of 2009 and a good portion of 2010. We will be looping in the best and brightest into our work in the areas described above and looking forward to achieving great results for our subscribers and clients.

**ABOUT RESEARCH 2.0**

Research 2.0 strives to be a "must read" source for emerging technology companies and investors. We combine an in-depth study of technology and customer adoption trends with institutional quality business, financial and valuation analysis.

We believe that our independent, flow-based research model gives us a distinct advantage in the market because we can synthesize a great deal of information from diverse sources all at once. We can then take that work and instantly put it to work without being encumbered by organizational, regulatory or other obstacles.

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**Preliminary Ecosystem**
**($ in millions, except per share data)**

| Company Name | Stock Price | TEV | FY Revenue | FY + 1 Revenue | FY + 2 Revenue | FY EPS | FY + 1 EPS | FY + 2 EPS | LTM Gross Margin | LTM Net Margin | TEV / FY+1 Revenue | Price / FY + 2 EPS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Software Infrastructure** | | | | | | | | | | | | |
| Adobe Systems Inc. (NasdaqGS:ADBE) | $ 24.16 | $10,620 | $2,879 | $3,039 | $3,398 | $ 1.49 | $ 1.63 | $ 1.95 | 29.6% | 2.3% | 3.5x | 12.4x |
| Dassault Systemes SA (ENXTPA:DSY) | $ 40.43 | $3,913 | $1,320 | $1,450 | $1,600 | $ 2.92 | $ 3.25 | $ 3.50 | 20.4% | 6.0% | 2.7x | 11.6x |
| Apple Inc. (NasdaqGS:AAPL) | $ 115.99 | $77,648 | $35,275 | $40,468 | $44,628 | $ 5.17 | $ 5.92 | $ 6.60 | 19.3% | 24.7% | 1.9x | 17.6x |
| Amazon.com Inc. (NasdaqGS:AMZN) | $ 78.17 | $30,439 | $21,967 | $25,840 | $30,101 | $ 1.47 | $ 1.92 | $ 2.57 | 4.1% | 29.2% | 1.2x | 30.5x |
| Autodesk, Inc. (NasdaqGS:ADSK) | $ 17.99 | $3,144 | $1,698 | $1,768 | $1,865 | $ 0.66 | $ 1.09 | $ 1.41 | 19.0% | 6.6% | 1.8x | 12.7x |
| Avid Technology Inc. (NasdaqGS:AVID) | $ 10.04 | $227 | $738 | $773 | $800 | $ 0.20 | $ 0.45 | $ 0.60 | -6.4% | -9.1% | 0.3x | 16.7x |
| Google Inc. (NasdaqGS:GOOG) | $ 369.78 | $100,895 | $23,313 | $26,548 | $31,155 | $ 20.84 | $ 24.00 | $ 27.53 | 30.4% | 31.3% | 3.8x | 13.4x |
| Nuance (NasdaqGS:NUAN) | $ 11.97 | $3,815 | $1,052 | $1,148 | $1,180 | $ 1.01 | $ 1.12 | $ 1.15 | 5.3% | 34.2% | 3.3x | 10.4x |
| Dolby Laboratories Inc. (NYSE:DLB) | $ 36.61 | $3,572 | $670 | $706 | $793 | $ 1.77 | $ 1.83 | $ 2.20 | 44.7% | 27.0% | 5.1x | 16.6x |
| **Content & Entertainment** | | | | | | | | | | | | |
| Activision Blizzard (NasdaqGS:ATVI) | $ 11.11 | $11,521 | $4,780 | $5,200 | $5,500 | $ 0.63 | $ 0.73 | $ 0.84 | -1.3% | 124.3% | 2.2x | 13.2x |
| DreamWorks (NasdaqGS:DWA) | $ 22.30 | $1,803 | $705 | $852 | $870 | $ 1.46 | $ 1.99 | $ 1.90 | 26.4% | -15.3% | 2.1x | 11.7x |
| Electronic Arts Inc. (NasdaqGS:ERTS) | $ 20.70 | $4,401 | $4,115 | $4,281 | $4,731 | $ (0.35) | $ 0.95 | $ 1.47 | -6.7% | 42.2% | 1.0x | 14.1x |
| Shanda Interactive (NasdaqGS:SNDA) | $ 42.88 | $2,565 | $651 | $742 | $825 | $ 2.95 | $ 3.26 | $ 3.62 | 40.4% | 44.7% | 3.5x | 11.9x |
| Sony Corporation (NYSE: SNE) | $ 23.98 | $33,575 | $78,054 | $77,810 | $80,061 | $ (1.76) | $ (1.54) | $ (0.12) | 4.1% | -9.4% | 0.4x | NM |
| Take-Two (NasdaqGS:TTWO) | $ 8.30 | $519 | $1,174 | $1,355 | $1,431 | $ 0.12 | $ 1.09 | $ 0.97 | 8.8% | 64.5% | 0.4x | 8.5x |
| Walt Disney Co. (NYSE:DIS) | $ 20.00 | $50,595 | $35,791 | $36,966 | $38,668 | $ 1.71 | $ 1.91 | $ 2.19 | 19.6% | 1.7% | 1.4x | 9.1x |
| Nintendo (Nasdaq.PK:NTDOY) | $ 37.20 | $26,606 | $18,000 | $18,500 | $19,000 | $ 2.04 | $ 2.50 | $ 3.59 | 29.1% | 20.5% | 1.4x | 10.4x |
| Microsoft (NasdaqGS:MSFT) | $ 18.75 | $148,400 | $60,953 | $62,754 | $66,693 | $ 1.75 | $ 1.95 | $ 2.18 | 39.6% | 7.1% | 2.4x | 8.6x |
| **Components** | | | | | | | | | | | | |
| NVIDIA (NasdaqGS:NVDA) | $ 11.32 | $4,911 | $2,248 | $2,748 | $3,425 | $ (0.14) | $ 0.23 | $ 0.74 | -1.5% | -16.4% | 1.8x | 15.3x |
| Synaptics Inc. (NasdaqGS:SYNA) | $ 29.78 | $942 | $452 | $490 | $535 | $ 2.02 | $ 1.93 | $ 2.24 | 13.6% | 34.8% | 1.9x | 13.3x |
| Intel Corporation (NasdaqGS:INTC) | $ 15.95 | $78,859 | $29,508 | $32,239 | $35,580 | $ 0.39 | $ 0.80 | $ 1.02 | 25.7% | -2.0% | 2.4x | 15.7x |
| ARM Holdings plc (LSE:ARM) | $ 1.62 | $1,930 | $462 | $500 | $544 | $ 0.08 | $ 0.10 | $ 0.11 | 20.1% | 15.3% | 3.9x | 15.2x |
| AMD (NYSE:AMD) | $ 3.43 | $6,435 | $4,153 | $4,619 | $5,339 | $ (1.93) | $ (1.28) | $ (0.45) | -16.7% | -0.9% | 1.4x | NM |
| Analog Devices Inc. (NYSE:ADI) | $ 20.63 | $4,725 | $1,801 | $1,925 | $2,095 | $ 0.51 | $ 0.79 | $ 1.01 | 24.3% | -0.3% | 2.5x | 20.3x |
| Texas Instruments Inc. (NYSE:TXN) | $ 16.96 | $19,057 | $7,974 | $8,622 | $9,427 | $ 0.33 | $ 0.70 | $ 1.05 | 21.5% | -9.6% | 2.2x | 16.2x |
| **Broadband Infrastucture** | | | | | | | | | | | | |
| Verizon (NYSE:VZ) | $ 32.79 | $171,984 | $107,369 | $110,111 | $113,185 | $ 2.51 | $ 2.66 | $ 2.75 | 18.5% | 4.2% | 1.6x | 11.9x |
| CIENA Corp. (NasdaqGS:CIEN) | $ 8.87 | $680 | $663 | $719 | $809 | $ (0.19) | $ 0.18 | $ 0.54 | 4.0% | 0.0% | 0.9x | 16.6x |
| Cisco Systems (NasdaqGS:CSCO) | $ 18.16 | $83,335 | $35,899 | $34,816 | $39,688 | $ 1.26 | $ 1.18 | $ 1.36 | 24.0% | 5.0% | 2.4x | 13.4x |
| Corning Inc. (NYSE:GLW) | $ 15.96 | $23,624 | $4,448 | $4,875 | $4,891 | $ 0.71 | $ 1.08 | $ 1.15 | 20.2% | 1.5% | 4.8x | 13.8x |
| AT&T, Inc. (NYSE:T) | $ 26.83 | $231,316 | $125,180 | $126,543 | $128,647 | $ 2.01 | $ 2.27 | $ 2.45 | 18.6% | 4.3% | 1.8x | 10.9x |
| Akamai (NasdaqGS:AKAM) | $ 20.06 | $3,293 | $865 | $948 | $1,075 | $ 1.65 | $ 1.71 | $ 1.84 | 32.2% | 24.3% | 3.5x | 10.9x |
| Equinix (NasdaqGS:EQIX) | $ 63.63 | $3,382 | $861 | $1,013 | $1,184 | $ 0.96 | $ 1.77 | $ 2.89 | 10.9% | 68.0% | 3.3x | 22.1x |
| Juniper (NasdaqGS:JNPR) | $ 17.03 | $6,700 | $3,302 | $3,624 | $4,273 | $ 0.80 | $ 1.02 | $ 1.42 | 20.0% | 26.0% | 1.8x | 12.0x |
| Broadcom (NasdaqGS:BRCM) | $ 22.06 | $8,936 | $3,593 | $4,099 | $4,946 | $ 0.32 | $ 0.75 | $ 0.23 | 8.2% | 23.3% | 2.2x | 95.9x |
| QUALCOMM (NasdaqGS:QCOM) | $ 41.19 | $59,089 | $9,804 | $11,178 | $12,246 | $ 1.61 | $ 2.12 | $ 2.33 | 33.6% | 20.7% | 5.3x | 17.7x |
| Motorola Inc. (NYSE:MOT) | $ 4.56 | $7,588 | $24,106 | $25,785 | $28,507 | $ (0.10) | $ 0.22 | $ 0.46 | 1.4% | -17.7% | 0.3x | 9.9x |
| **Hardware Infrastructure** | | | | | | | | | | | | |
| IBM (NYSE:IBM) | $ 102.22 | $158,377 | $97,925 | $99,970 | $99,691 | $ 9.06 | $ 9.81 | $ 9.88 | 17.2% | 4.9% | 1.6x | 10.3x |
| Hewlett-Packard (NYSE:HPQ) | $ 34.15 | $91,047 | $113,514 | $116,946 | $120,502 | $ 3.72 | $ 4.04 | $ 4.35 | 9.1% | 10.2% | 0.8x | 7.8x |
| Dell Inc. (NasdaqGS:DELL) | $ 10.32 | $13,054 | $52,114 | $53,258 | $54,630 | $ 1.05 | $ 1.21 | $ 1.29 | 5.7% | -0.1% | 0.2x | 8.0x |
| Logitech (NasdaqGS:LOGI) | $ 11.35 | $1,544 | $2,299 | $2,137 | $2,241 | $ 0.86 | $ 0.81 | $ 1.00 | 12.1% | 5.3% | 0.7x | 11.3x |