# “Radon” proposal

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Xbox division, Microsoft Corporation

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To the board of directors:

Thank you for considering our proposal. We here at Microsoft have always strived to make, and sustain, an impact in as many related markets as possible. The Xbox division has been considering the possibilities of a portable Xbox for quite some time now, and the best of our ideas are condensed in this proposal.

The proposed project involves an initial investment of $110 million, and a yearly sustenance cost of $5 million. The product has a life cycle of nine years, with a payback period of four years, and a 42% return on investment.

We expect to take the portable gaming market by storm in a year's time. We're hoping that, after reading this proposal, you are as keen and excited about Radon as we are.

Please feel free to contact us regarding the status of the proposal, and any questions or concerns that you may have.

Sincerely,

Shrivathsa Bhargav

Proposal enclosed.

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## Executive summary

### The market today

Portable gaming has evolved greatly since its inception in the 1990's. In 2006 alone, portable gaming consoles represented a $3 billion market, including hardware, accessories, and software. There are only two big-name competitors in the seventh-generation portable gaming market today, and these competitors own a large percentage of market share: Nintendo (their products are GameBoy Advance, DS), and Sony (PlayStation Portable). Nintendo and Sony together control nearly 90% of the market, so it is easy to ignore the smaller players. In addition, there is only one minor competitor: Nokia (N-Gage). The major players have forced many other entrants out; Tapwave (Zodiac) and Tiger Telematics (Gizmondo) have discontinued production.

The Nintendo DS has enjoyed many hardware iterations over its life cycle, while Sony's PSP focuses more on software updates, rather than hardware. These companies have different approaches to online play (more on this later). Also of note is the primary market of both these companies: Japan. Success in Japan translates to increased revenue that, in turn, is utilized for strengthening market share in the US.

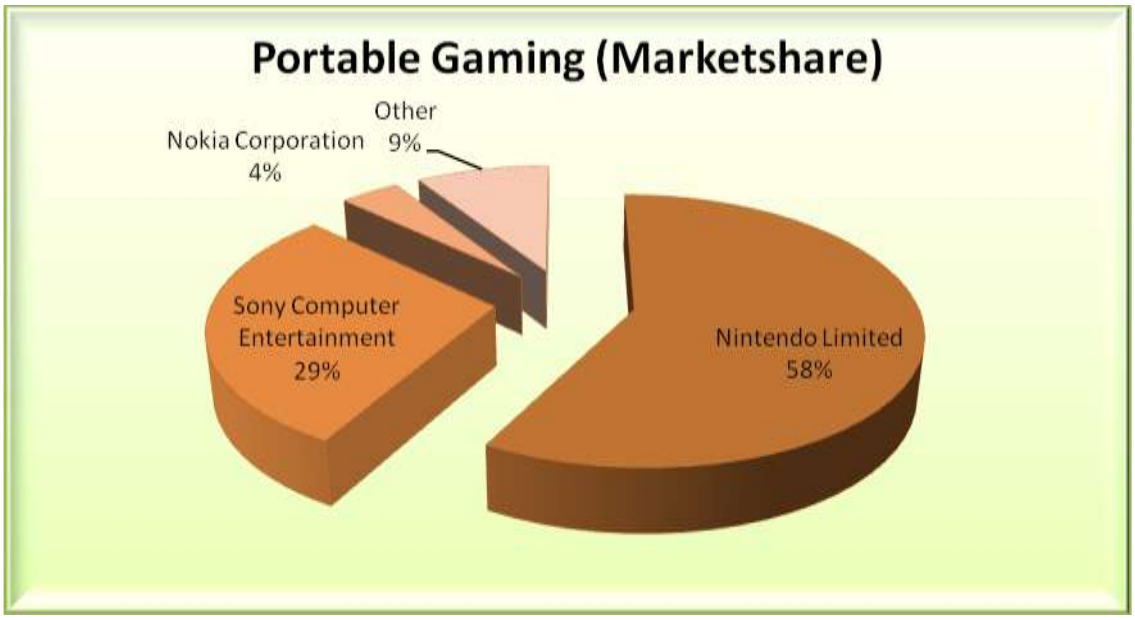


Figure 1 - Current market share

### Entering the market

Since the success of the Xbox, and its successor, the Xbox 360, Microsoft's portable gaming division has wanted to make a foray into the portable gaming market, bringing the lessons and experiences gained through the home-console space with us. The pilot program that we began in the fourth quarter of 2005 has come to fruition, with very encouraging results. Exhaustive analyses have revealed that the first half of 2008 is the most optimal launch windows in the next three years. We have to begin now to achieve a launch during this window.

Economical feasibility was also proven. The minimum investment to launch this project is $110 million, with around $5 million needed ever year to sustain it through its life cycle. The business model at work here is the "Razor and Blades." The return on investment is projected to be 42%. This is a moderate risk/high reward venture. The payback period on this project is estimated to be four years. With a life-cycle of nine years, this means that production is scalable depending on market performance halfway through the life cycle.

The analyses also showed that our target demographic should be the 18-35 year old male, who tends to devote plenty of time to online gaming. The Xbox brand is already quite strong. By leveraging this brand-acknowledgment amongst the target audience, and launching with the largest library of any portable console, we will be able to carve out a slice of the market.

## Technical solution

This section will cover the technical specifications of the device (codenamed "Radon"). It will also cover detailed information relevant to deployment into the market, online play, and other aspects.

### Technology

We began by studying what the competition currently offers, and what the target demographic expects from a portable console. The ideal console, as envisioned by the majority of the target demographic, is a fast machine with a large screen, long battery life, plenty of storage, and online-capable.

The Xbox team shares their vision. We envision a console that is always connected, can play every original Xbox game, and acts as a hub for portable entertainment. Let us look at each aspect of Radon in turn.

### Processor and Graphics

The processor will be an Intel Mobile core with a maximum speed of 1.2 GHz. In addition, because Radon will be capable with nearly the entire original Xbox library, the processor will be scalable all the way down to the original Xbox processor speed of 733 MHz. This results in the highest possible battery life for every situation. The processor will carry licensing fees with it.

To understand the choice of the graphics processing unit (GPU), let's take a step back and understand how the GPU in the Xbox 360 handles backwards compatibility (BC) with the original Xbox. For every game that is backwards compatible, a custom patch is developed by the Xbox BC team. The Xbox 360 then downloads this patch, and decodes certain graphics functions accordingly. Since the majority of Xbox titles are now BC, we can use the same approach for Radon.

Accordingly, we have decided on the ATI Triton, which is a scaled down version of the 360's GPU, although it retains most of the same functionality. The GPU is DirectX 9 capable, with all the usual bells and whistles: per-pixel shading, high dynamic range, Note that the GPU will also need licensing fees from ATI Technologies.

## Screen size

One of the biggest gripes that the consumer has with his/her portable is the small screen size. The Sony PSP currently has the biggest screen size of all portables. At 4.3” diagonal, it provides just enough screen real-estate to play a game, and not necessarily to enjoy it. The screen resolution is also a measly 480x272 pixels. We needed to increase the size of the screen without making the whole unit bulkier. Thanks to recent advancements in display technology, we have been able to do so.

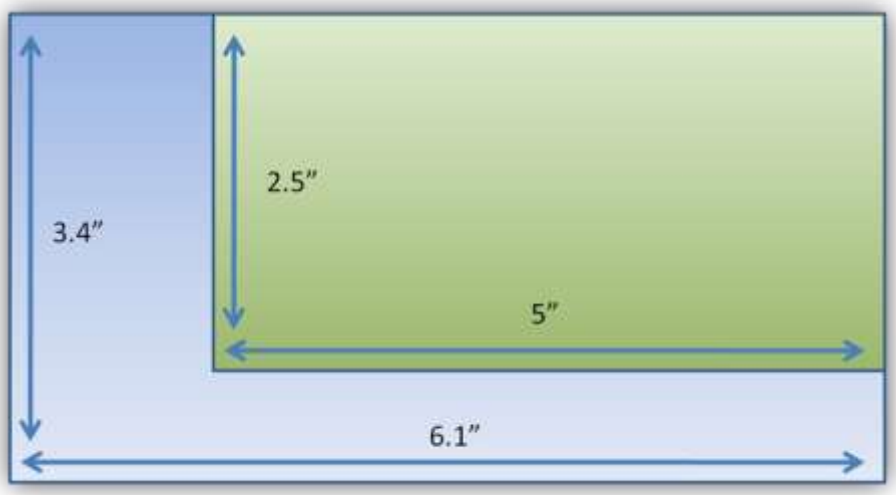


Figure 2 - Comparison of screen sizes, PSP (inset) and Radon

Flexible Organic Light Emitting Diodes (OLEDs) are cutting-edge display technology that enables the screen to be tucked away and out of sight when not in use. In addition, the device will scale the resolution and orientation of the display according to the amount of screen area exposed. The screen will be curled up inside the two halves of the device. By stretching the two halves apart, the screen will be exposed to the user. At its fullest expansion, the screen measures 7” diagonally. This is an incredibly large screen, without the drawback of a large resultant device size. At this size, we are able to pack in a high-definition (HD) widescreen resolution of 1280 x 720. This means that games can take advantage of HD picture quality. In addition, flexible OLEDs are up to 70% more energy efficient than conventional LCD, and provide better visibility in low-light conditions and at wider viewing angles.

## Battery

With such incredible power under the hood, it is important to have an incredible battery fueling it. We are in talks with a leading battery manufacturer to acquire mass-produced hydrogen fuel cells as our power source. Despite popular belief, intensive research has shown that hydrogen fuel cells are *less dangerous* than conventional Lithium-Ion battery packs, and are considerably more powerful. As a rough estimate, a fully charged battery pack in the Radon will be able to provide 7 hours of continuous online gaming.

So much processing power will generate considerable amounts of heat. Dispensing this heat efficiently is critical in a portable device. Radon will eschew fan-based cooling, instead opting for passive cooling via CO2 heat-pipes. In addition, the back of the exposed screen will be used to dispel heat.

## Storage

Radon will be the center of portable entertainment. To that end, plenty of storage must be offered to the user. Currently, we are in talks with Samsung Inc. to use their 1.8” 64GB solid-state drive. Solid-state drives consume less energy than platter-based hard drives, while providing faster random-access (hard drives provide better sequential access). If the user finds this vast amount of storage to be insufficient, there is always the micro-SD card slot on the device.

## Online capabilities and peripherals

Radon will have extensive online capabilities. The current market leaders, Nintendo and Sony, have varying approaches to online play. There is no unified service. Online matchmaking does not exist, yet. Ad hoc play is emphasized as being the future of portable multiplayer gaming. Radon will change all that.

We already have an extremely successful online infrastructure in Xbox Live. It offers online TrueSkill-based matchmaking, unified friends lists across all games, downloadable content, and so on. By bringing Xbox Live to the portable console industry, Radon will revolutionize portable gaming. Online play will be the center of the attraction.

Utilizing the IEEE 802.11a/b/g/n standard, Radon can connect both to Ad Hoc networks, as well as to Xbox Live through a Wi-Fi enabled internet hotspot (both encrypted and unencrypted). This means that all the hallmarks of Xbox Live play -- your friends list, gamerscore, and in-game achievements -- can be carried forward from your regular console onto your portable, seamlessly, anywhere in the world.

Radon will be Bluetooth enabled for wireless accessories and headsets (to be decided at a future time). Two USB 2.0 ports enable wired peripherals, as well as transfer of converted original Xbox games from a Windows PC or an Xbox 360 (detailed later in this proposal). Audio ports include a microphone in (for online communication through Xbox Live), speaker out, and built-in speaker. Through SVGA ports, Radon will be capable of outputting HD games/videos onto compatible TVs/monitors.

## Game library

In the gaming world, game titles are everything. Using the same BC technology as the Xbox 360, we are able to launch with the biggest library of games for a portable console. Any existing original Xbox game can be converted into a Radon-compatible format using a free converter on Windows XP SP2/Windows Vista machine, or an Xbox 360, and transferred onto the Radon using the USB port. Initial conversion tests showed a conversion time of 15 minutes for a single title, which is quite acceptable. The original Xbox library contains exclusive game franchises like Halo, Project Gotham Racing, and Mech Assault, as well as explosive third-party franchises like Rainbow Six, Ghost Recon, Splinter Cell, Grand Theft Auto, Burnout, Prince of Persia, and sports franchises.

New titles will also be developed by both first parties and third parties. We are currently in discussion with studios such as Bungie, Rare, Take Two, and EA. These titles will take advantage of the DirectX 9 capable video processor to deliver life-like graphics on the move.

## Benefits analysis

Launching a portable device with the Xbox brand name behind it will all but ensure success in the market. The market leader, Nintendo, is not in direct competition with us, simply because their target demographic is completely different from ours. In fact, the bigger competitor for us will be Sony's PSP with its lineup of action, adventure, and racing games. However, Sony's PSP has poorly implemented online functionality, and no consistency between games. As we have proven with the Xbox 360, we can change the online game space quite easily, because there is hardly any established gaming standard, and Xbox Live is very well developed at this stage. A more complete economic analysis can be found in the "cost proposal" section of this document.

## Risk management

There are few areas of significant risk with Radon. These are radiation, heat dispersion, and ergonomics.

### Radiation

The wireless adapters built into the device pose negligible danger to the user. It has been long proved that adapters on the 802.11 standard's frequencies pose no threat through radiation damage. In fact, radiation through Wi-Fi is many orders of magnitude less than cell-phone radiation. The screen itself produces no damaging radiation, because of its new technology and implementation.

### Heat dispersion

Through efficient scaling and cooling of both the central processing unit and the graphics processor, the heat dispersed at any one time is not sufficient to cause any damage or discomfort to the user. Through our preliminary tests, we have found that the average temperature of Radon after several hours of continuous operation is no higher than four degrees Fahrenheit more than the ambient temperature.

### Ergonomics

Since users are expected to spend extended hours playing the Radon, it is important that the physical design be very comfortable to handle. Accordingly, the two halves of Radon will fit very snugly in the palms of both hands during play. Through our prototype testers, we have found that the most comfortable holding angle is also the safest, in terms of wrist and arm fatigue. As with any portable instrument, though, users must take regular breaks every hour to prevent injury to themselves.

# Management plan

## Staffing/Résumés

We will be using the brightest minds of the Xbox division to staff the Radon subdivision. There will be 28 members involved in this project, and the key members have their partial résumés listed, in alphabetical order. Complete résumés are available on file.

### Shrivathsa Bhargav

Education

Undergraduate: State University of New York at Stony Brook, Bachelors in Electrical Engineering

Graduate: Stanford University, Masters in Marine Biology

Post-graduate: Stanford University, PhD in horticulture

Work experience

1987-1993: Citigroup, Branch manager

1993-1993: Enron, Intern

1993-1994: Flowers, Inc., Research manager

1993-1997: Rutgers University, Professor of horticulture

1997-present: Microsoft, senior project lead

Relevant skills

Strong leadership qualities

VLSI design/system validation

Two-time winner of "Emma Lauston horticulture award"

Embedded systems

User Interface design

### William Cheng

Education

Undergraduate: State University of New York at Stony Brook, Bachelors in Electrical Engineering

Graduate: Massachusetts Institute of Technology, Masters in Electrical Engineering

Massachusetts Institute of Technology, Masters in Applied Physics

Post-graduate: Massachusetts Institute of Technology, PhD in Neuro-networks

University of Alabama, PhD in Statistical analysis

Work experience:

1968-1985: Stanford University, Professor of applied physics

1985-1998: General Electric (climate control division), Lead technician

1998-present: Microsoft, project lead

Relevant skills:

Highly creative

Computer networking

Digital signal processing

Content delivery systems

## Implementation

As previously mentioned, we are aiming for an early-2008 launch for Radon. At the time of writing of this document, we have exactly one year to hit the market. Accordingly, our timeline is quite cramped, but definitely feasible.

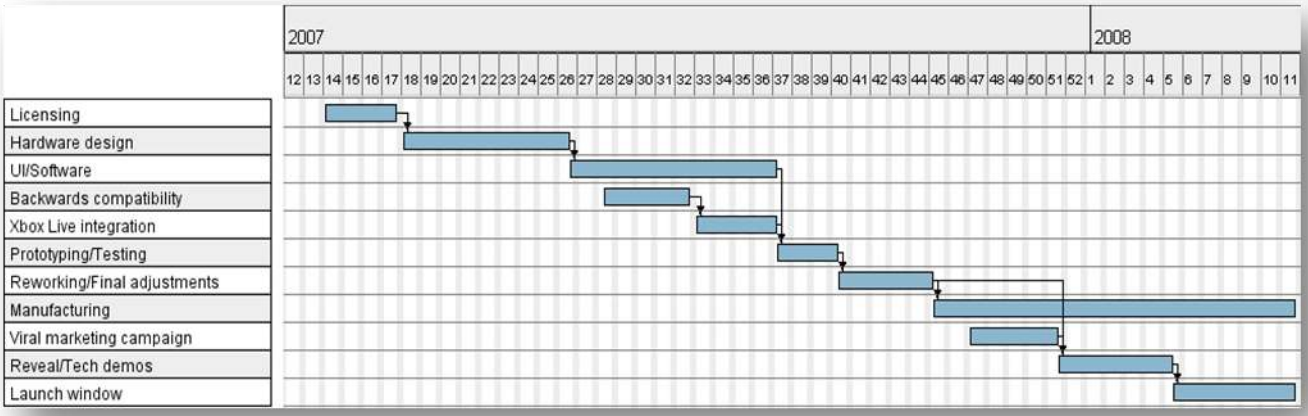


Figure 3 - Project timeline up to launch

The components of the timeline are explained briefly:

- Licensing: Since both processors are from third-parties, there will be licensing negotiations required. This is expected to take less than two weeks. Other licensing issues involve video and audio codec royalties.
- Hardware design: This involves designing the shell, as well as the electronics. One of the biggest concerns is real-estate, since the device must be portable enough, as well as reasonably light-weight. Sufficient effort must be expended on heat dispersion and battery life. Convenient and ergonomic positioning of the controls and ports is essential. Fragility in the device is unacceptable; the device must be portable as well as rugged. Rubber grips are recommended. The battery, as well as the solid-state drive must be shielded from impact damage. Additional protection must be offered for the screen to prevent tearing. A partial locking mechanism must be created (similar to Venetian blinds) for partial-exposure of the screen.
- UI/Software: This involves the creation, porting, and fine-tuning of all the software and user-interface aspects of Radon. Also included are personalization options, and USB connectivity to both Windows machines, as well as the Xbox 360. Downloading, hashing, and verification of downloaded content for integrity is important; cheating on Xbox Live using hacked content must be battled at all times. Regular software updates enable more and more functionality through the life of the device.
  Content providers (movie studios and music artists) are highly inclined towards the inclusion of digital rights management techniques to protect their works. We are more

than happy to oblige, since the support of these content providers is important in the market as it stands today.

Backwards compatibility can be heavily borrowed from the Xbox 360 development team. Many lessons were learned, and several strong strategies have been developed. We are aiming to make at least 90% of all original Xbox titles backwards compatible at or shortly after Radon's launch.

- Xbox Live integration: This is an important aspect of Radon, and one that will have ample resources devoted to it. Everything from matchmaking, to ad hoc networking, content delivery and microtransactions, friends lists and achievements will be fine-tuned. Xbox Live already has an outstanding infrastructure ready for access, and with the advent of our Live Anywhere technology, integration with Xbox Live becomes crucial, and easier.

Figure 4 - Friends lists will carry over onto Radon

- Prototyping/Testing: We will manufacture a very small number of units for internal durability and play testing. The units manufactured will be feature-complete, and the testing will be comprehensive. In addition to internal testing, a few units will be made available to focus groups (with accompanying NDAs) to see their reaction. Results gleaned from this testing will be used for the next stage.
- Reworking/Final adjustments: These adjustments obviously cannot be major on the hardware side, but software always has room for big changes, which is why this phase is nearly half the length of the software design phase.
- Manufacturing: The core components and hardware will be manufactured using the same production lines as the Zune. Note that manufacturing in the timeline is shown to extend all the way up to the launch window. According to our predictions, we will be unable to keep up with the demand for several months after launch.
- Viral marketing: We had a very successful campaign leading up to the exciting release of our blockbuster first-party franchise, Halo 2. We are currently in negotiations with the same advertising firm for the launch of the Radon as well. As with our previous viral marketing campaigns, this one will keep unveiling new clues about the product until the "big reveal".
- Reveal/Tech demos: At this point, we will have fully working, near-final models to reveal in an explosive fashion through the media. Right after this, the tech demos will begin, and demo pieces will appear at common consumer electronics stores. If our marketing campaign has been successful, we will be able to channel all this hype into a booming launch.
- Launch window: This is the optimal launch window for quite some time to come, and demand will outstrip supply for a few months.

## Cost proposal

This section provides an extensive overview of the economics behind this ambitious product.

### Initial implementation

The launch budget for this project is $110 million. Considering that the competition's console (the PSP) had a launch budget of $90 million will help put this budget into perspective. The breakdown of this first year budget is shown in figure 4 and further detailed in table 1.

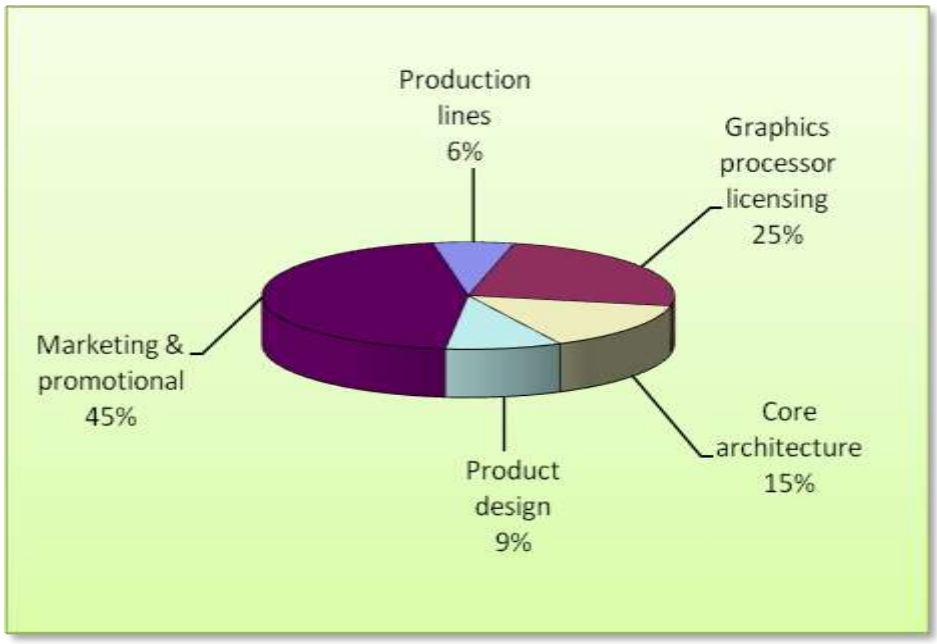


Figure 5 - Setup cost breakdown

| Type of cost | Amount (in million $) |
|---|---|
| Repurposing | 7 |
| Graphics processor licensing (ATI) | 27 |
| Core architecture (in-house) | 16 |
| Product design / feature integration | 10 |
| Marketing / promotional | 50 |

Table 1 - Setup cost breakdown

The initial expected cost price for manufacturing a single unit in large quantities (million+) works out to $569. The breakdown of this price into component pricing is given in figure 6, and enumerated in table 2.

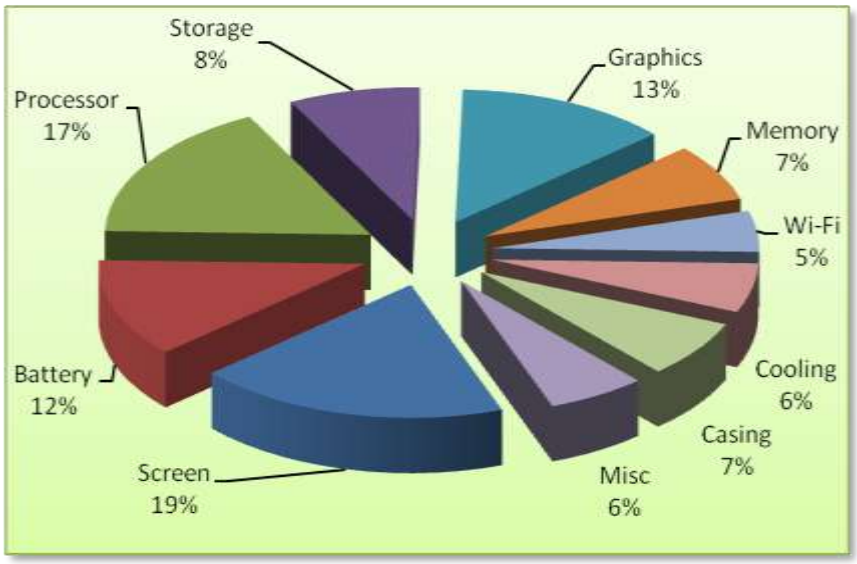


Figure 6 - Breakdown of unit costs chart

| Component | Cost | % Cost |
|---|---|---|
| Screen | $70.11 | 19% |
| Battery | $51.66 | 14% |
| Processor | $55.35 | 15% |
| Storage | $29.52 | 8% |
| Graphics | $51.66 | 14% |
| Memory | $22.14 | 6% |
| Wi-Fi | $18.45 | 5% |
| Cooling | $22.14 | 6% |
| Casing | $25.83 | 7% |
| Misc | $22.14 | 6% |
| Total | $369.00 | 100% |

Table 2 - Breakdown of unit costs

The flexible organic LED screen is the most important component, and the most expensive. This is because of the newness of the technology at work, and the cost is expected to fall steadily through the life cycle of the product. The processor and the graphics chipset are also currently expensive, but not overly so. Our partners assure us that most of this cost comes from attempting to miniaturize the chipsets, and is guaranteed to go down by year three. Other minor costs arise in the memory, casing, cooling, and wi-fi antennae components of Radon. The miscellaneous costs involve testing and packaging the Radon.

## Product life cycle

The launch budget for this project is $110 million. Considering that the competition's console (the PSP) had a launch budget of $90 million will help put this budget into perspective. We estimate a nine year product cycle. Unfortunately, our product will not be profitable for the first two years, because the cost of manufacturing the product is more than the price we will enter the market at. This is required to ensure market penetration, and to remain competitive. Once the product does start to become profitable (and this will happen due to the falling prices of our core components), it is advisable to pass on some of these savings to the customer, in order to remain competitive. The perceived salvage value of the production plant is $22 million (towards our next generation product). The expected cash flow is enumerated in table 1.

Table 3 - Cash flow through product cycle

| Year | # of units sold | Cost price / unit | Selling price / unit | Profit / unit | Inflow | Outflow | Net flow |
|---|---|---|---|---|---|---|---|
| **0** | 0 | $0 | $0 | $0 | $0 | $110,000,000 | -$110,000,000 |
| **1** | 8,000,000 | $369 | $299 | -$70 | $2,392,000,000 | $2,962,000,000 | -$570,000,000 |
| **2** | 10,000,000 | $329 | $299 | -$30 | $2,990,000,000 | $3,300,000,000 | -$310,000,000 |
| **3** | 12,000,000 | $289 | $299 | $10 | $3,588,000,000 | $3,478,000,000 | $110,000,000 |
| **4** | 13,000,000 | $229 | $279 | $50 | $3,627,000,000 | $2,987,000,000 | $640,000,000 |
| **5** | 13,000,000 | $179 | $249 | $70 | $3,237,000,000 | $2,337,000,000 | $900,000,000 |
| **6** | 15,000,000 | $149 | $249 | $100 | $3,735,000,000 | $2,245,000,000 | $1,490,000,000 |
| **7** | 12,000,000 | $129 | $199 | $70 | $2,388,000,000 | $1,558,000,000 | $830,000,000 |
| **8** | 9,000,000 | $99 | $149 | $50 | $1,341,000,000 | $901,000,000 | $440,000,000 |
| **9** | 6,000,000 | $79 | $99 | $20 | $594,000,000 | $484,000,000 | $110,000,000 |
| **10** | 0 | $0 | $0 | $0 | $22,000,000 | $0 | $22,000,000 |

## Return on investment

Our $110 million initial investment, coupled with our losses during years one and two means that Radon will not profit our company until year five. However, everything beyond year five is nearly completely profit (we must not neglect factoring in taxes of $5 million per year, plant maintenance costs of $1 million a year, and marketing costs of $4 million a year). This is shown as an intuitive cash-flow diagram in figure 4.

Figure 7 – Net cash flow diagram

The return on investment on this project, based on projected figures is **42%**.

## Payback period

Utilizing a conventional payback period, it can be seen from the net cash flow diagram that at the end of year four, an amount of $240 million from our investment has still not been recovered. However, in year five, we generate a profit of $900 million. Therefore, we would recover our remaining $240 million in approximately four months into year five. The total conventional payback period is then **four years and four months**.

## Present and future worth

The net present worth of this project, at our established minimum attractive rate of return (MARR) of 18% can be calculated from the net cash flow diagram to be $1274.27 million.

On the other hand, the future worth of this product in ten years will be $6669.34 million.

# Summary and recommendations

The handheld gaming market is a several billion dollar market – one that we must take advantage of. While our competitors have a startling grasp on the market, it is not an impossible feat to make a dent in the market; we did it with the original Xbox, and we can certainly utilize the hard-earned lessons from that endeavor. Once this project gets under way, talks with internal software studios (Rare, and Bungie), as well as third-party publishers (EA, Activision, Atari) can begin.

From the information presented in this proposal, it is clear that the management must not delay our entry into this lucrative market. A successful entry into this market means that we will be able to take over a significant chunk of market share in the *next* generation.