History of the Smart Toy Lab and Intel® Play™ Toys

Herman D'Hooge, Design Center (Connected Products Division), Intel Corp.
Melanie Goldstein, Smart Toy Lab (Connected Products Division), Intel Corp.

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ABSTRACT

In 1998, Intel Corp. and Mattel, Inc. joined forces to create a "Smart Toy Lab" in a small, trendy office space located in the northwestern part of Portland, Oregon, USA. The lab was to bring together the best toy design and consumer marketing practices from Mattel with the technology expertise and innovation of Intel engineers. The opening of this office marked the beginning of the Intel Play brand of technology toys, starting with the flagship QX3™ Computer Microscope.

This paper reviews how and why this unlikely pair of collaborators came together, how the collaboration of resources and ideas worked over time, why the two companies parted ways, and why Intel has continued the development of Intel Play-branded products to date.

INTRODUCTION

In 1997, Intel was seeking to expand its reach into the consumer marketplace, and in particular into the children's market. They engaged in discussions with the toy industry giants and specifically with the market segment leader, Mattel, Inc. to better understand Mattel's efforts in the emerging field of interactive toys. Simultaneously, Mattel was exploring the idea of novel, interactive high-tech toy concepts that involved the use of the personal computer. Small sound chips and other low-cost, standalone technologies had been part of the toy industry for decades, but the quality of the electronically enhanced experience left a lot to be desired. Also, Mattel had a successful "interactive" division that developed children's CD-ROMs and game console products based upon their popular brands, such as Barbie* and Hot Wheels*. But Mattel was eager to do more. "Children are getting older younger," or CAGOY was the catch phrase, meaning that children stopped playing with toys at a younger age than a decade before. The traditional toy industry was significantly damaged by the emergence of the video game console marketplace; traditional toy companies entered this marketplace as secondary players, well after the market leaders who developed both the consoles and the platforms for game development. Mattel, and other major toy companies such as Lego and Hasbro, were determined not to be left behind in the next wave of technology to enter the children's marketplace; they wanted to recapture the video game enthusiast.

From these vantage points, Intel and Mattel made a decision to join forces to answer this fundamental question: what novel products emerge when you put Mattel toy designers together with Intel technologists and engineers?

SPRING 1998: FORMATION OF THE SMART TOY LAB

Executives from the Strategic Planning Department at Mattel and the Developer Relations Department (part of the Content Group) at Intel devised a business plan. The basic idea was a simple one: create an office space that merges an engineering team from Intel with a toy design team from Mattel. The team's mission was to invent and develop innovative products that would be the next "new thing" in toys. The lab would be located in the Portland, Oregon area to leverage the technology expertise, research, and technologies from the Intel® Architecture Labs in Hillsboro, Oregon. Executives from both companies were adamant that the office be located off campus–geographically separate from any main Mattel or Intel facilities. They wanted to empower this team to think and act as a startup and to liberate their operation from the standard operating procedures and slow decision making of either corporation. And thus the Intel/Mattel Smart Toy Lab (STL) was formed in a small office space

above an antique mall in a trendy shopping district of Northwest Portland.

The core team was intentionally kept very small, focusing exclusively on the invention, design, and development of the toys that were to hit the market in time for next year's holiday season. They drew upon the resources and expertise of the parent companies for many of their support functions as needed. This allowed the STL to select the best from each parent company. Furthermore, both companies learned from the strengths of their partner. Mattel, at its headquarters in El Segundo, California owned the marketing and sales of the products and the overseas manufacturing. Intel, at the Jones Farm campus in Hillsboro, Oregon and its headquarters in Santa Clara, California owned the technology and engineering related to the product's development and integration.

The team at the STL included three tech-savvy toy designers, one from Mattel's preschool division, one from Hasbro's boys division, and the third one from the independent toy inventor community. Four playful engineers were handpicked from the Intel Architecture Labs for their creativity, versatility, and innovative development experience. Finally, three producers were hired by Mattel to manage and coordinate the product development. The executive teams from the Intel Developer Relations Group and the Mattel Strategic Relations Group became the directors of the STL.

THE BIRTH OF THE INTEL PLAY BRAND

The original vision of the kinds of technology toys that ought to emerge from the intersection of Intel (technology leader) and Mattel (toy leader) came from joint brainstorming sessions. This vision remained largely unchanged during the first three years of the Smart Toy Lab (STL) and became the foundation of what later became the Intel Play brand.

The ground rules for a worthy Intel/Mattel toy were as follows:

1. **Fun**. Fun is synonymous with toys. Unless a toy delivers well on fun, nothing else matters. There currently is no IEEE standard that provides an objective and scientific measure for "fun," but focus testing usually provides a good idea.
2. **Open-ended**. Play patterns range from fully structured to fully open-ended. A structured play pattern consists of a fixed set of rules that bounds play. Television watching is an extreme example. Someone decides what it is you're going to watch and play just happens to the player. Video games provide a lot more interaction, but the rules and boundaries of the activity are clearly defined; the script is predefined by the game designer. Open-ended play has no rules. The child defines the rules and the play allows infinite variation. A ball is an excellent example of open-ended play. There are no rules that restrict ball play. Play with a friend, multiple friends, add a stick to play a baseball-type game, put pins on the floor for a bowling-type game, throw it, kick it, bounce it, make up your own rules that go far beyond what the toy designer may have imagined.
3. **Child is in control**. The child controls the pace of the play. Teddy bears stuffed with voice chips or other pieces of technology usually end up performing for the child. Those are examples of technology automating the play. This is the typical result when adding technology to an existing toy. We chose to always put the child in control and make the toy a tool in the hands of the child, its use only limited by the child's imagination.
4. **Challenging and creative**. Children seek instant gratification, but are also easily bored: "that's all I can do with a toy." If an activity is too difficult, it will become frustrating; if it is too easy the child quickly loses interest. Play that is challenging invites repeated use and is seen as providing more value to those who pay for the toy.
5. **Educational**. While playing with an educational toy is fun, the learning comes for free. This fact is not lost on parents who will often go to great lengths to direct their children towards toys that teach them something.
6. **Grows with the child**. As children grow older, they can continue to play with the same toy but in different ways. The child discovers, masters, and enjoys different features of the same product. This enhances the play value of the toy and often justifies the somewhat higher price of a good technology toy.
7. **Involve the Personal Computer**. Mention "Intel" to consumers and they immediately think Personal Computers. For the STL, this means that the PC plays an essential role in the toy's play pattern.
8. **Perceived to be high technology**. The goal for low-risk development for a nine months to one-year development cycle is to stay with well-understood and mature technology ingredients. However, it is important that the consumers, particularly the parents, perceive the toy to be high-tech. Daily interaction between engineers and toy designers helped the team marry the innovative industrial design and user interfaces with technology.

9. **Innovative**. As industry leaders, we want our products to be the first-of-a-kind, never seen before in a toy.
10. **At least one truly magical feature**. We learned this from Mattel and it still resonates strongly. A toy has to have that one special feature that makes a kid go "wow."

These ten golden rules were internalized by every individual on the development team and became the promise associated with Intel's toy brand. Intel brand strategists were engaged to help fine-tune, name, embody, and communicate this brand promise to parents and children. The Intel Play brand extension (or sub-brand) was created so that the Intel name would provide these toys with a mark of high quality and advanced technology. The Mattel logo would remain on the box to offer parents the assurance that this product would have great play value. The Intel Play sub-brand had its own logo, packaging style, and marketing materials, which appealed to children. This is in contrast to Intel's standard packaging and branding guidelines, which were not formulated with children in mind.

SUMMER 1998: CONCEPT CREATION

As the branding and messaging for the Intel Play line was being developed, the Smart Toy Lab (STL) development team rushed to create innovative product ideas that rated highly when measured against the ten ground rules. The first product ideas, along with the Intel Play strategy, were presented to Jill Barad, CEO of Mattel, and Andy Grove, Chairman of Intel, and to the Intel branding team for approval.

During the concept creation, Intel engineers got their initial exposure to the notion of *play pattern*, the specific ways a child uses a toy. Joint brainstorms thus far had only generated long lists of product ideas. To go from an idea to a fully developed play pattern is a long and involved process. This is where the Mattel toy designers applied their unique skill and magic. Simultaneously, the toy designers were introduced to a wealth of new state-of-the-art technologies from the Intel® Architecture Labs, as well as given insight into roadmaps for upcoming technology innovations.

It was made clear early on that the fundamentals of children's play are not defined by a specific toy or technology. These fundamentals have remained unchanged for as long as mankind has been around, and we quickly realized that not even the most advanced [1]technology was going to change that. Fundamental play values include exploration, discovery, creation, expression, imagination, nurturing, and collection.

However, technology, if used wisely, does provide new tools to the toy designer to define new play experiences, but they will always connect back to the fundamental play values.

Understanding that poor results were to be expected if technology was merely added to existing toy concepts, the team took a different approach. They set out to create entirely novel and innovative toy concepts that were uniquely enabled by technology and the PC. In other words, if the technology was taken away, the concept wouldn't be able to exist.

In the summer of 1998, eight concepts emerged that were considered to have reasonable potential and that warranted further exploration. It was felt that these concepts were worth presenting to the executive team as the initial crop and output of the companies collaborative experiment. These eight concepts were as follows:

1. **Internet Discovery Set**: This was a Radio Frequency (RF) tag reader that allowed children to navigate to Web sites using RF tags embedded into small physical toys. In other words, each of these toys would have a unique URL embedded within it. Placing the toy on the reader would point the PC's browser at the corresponding Web site (encoded as the RF identifier), and the child could engage in online activities related to the toy.
2. **Ultramind Magic 8-Ball**: This was a stress-sensing device that transferred biofeedback data to the computer and translated it into a series of "magic" and "fortune teller," or "truth or dare" games.
3. **Robox**: This was a PC/portable, artificial life game that allows children to build and groom robotic players for competition on their PC, then transfer them to a portable game device so that they could compete with their friends in the schoolyard.
4. **See Ya Bubba** (later renamed the Me2Cam): This was a series of immersive arcade-style games that utilize advanced computer-vision technology to transport a moving image of the child into game play.
5. **Computer Microscope**: This was a microscope with a PC-camera embedded as a replacement for the eyepiece. Users could view the magnified images on their PC screen in full color.
6. **Music Jammer**: This was a PC-connected musical instrument that allows children to create music with their PC by physically manipulating an abstract, tactile form. The user selects a specific instrument to control with the Jammer. The music is then

automatically harmonized by the computer software, which also shows a cool visual representation of the music.

7. **PC Fun Phone**: This was a kid's pretend cell phone that connects to the PC via Radio Frequency (RF) transmission. The PC software would provide personal messages, jokes, and other features programmed at the PC and sent to the portable phone.
8. **PC Explorer**: This was a classic radio-controlled car equipped with a wireless video camera navigated and programmed from the PC.

Play patterns, expressed as story boards and product concept sketches, and potential industrial designs were developed by the toy designers while engineers developed product architectures, built working prototypes to validate their assumptions, experimented with solution alternatives, and tried to understand product costs. All eight concepts were tested in focus groups with children (the users) and parents (the purchasers).

FALL 1998: CONCEPT SELECTION

From the combined design, engineering, and market feasibility insights, three product concepts emerged–or perhaps more accurately, survived–as serious candidates for full productization and were given the green light. The selected concepts were the Intel® Play™ QX3™ Computer Microscope, the Internet Discovery Set, and the Intel® Play™ Me2Cam* Computer Video Camera.

All three products began development in earnest, but the Computer Microscope, given its perfect fit with the Intel Play brand and the fact that it had fully developed and rich and open-ended play patterns, quickly became the forerunner and flagship product.

Rather than growing a large internal organization with skills that might only be needed for the development of one product, external experts, developers, vendors, and suppliers were engaged to collaborate with the Smart Toy Lab (STL) on the development of the product.

The default model was to outsource development wherever possible, yet keep the overall program management and a limited amount of engineering work. By assigning STL engineers to key areas that linked the work of other vendors together, we kept our finger on the pulse of the project at all times.

The STL staff delivered the industrial design, the product architecture, the middleware video streaming software, and the overall product integration and validation for the Computer Microscope. About ten external companies and/or internal groups within Intel or Mattel collaborated with the STL staff in the areas of optics, illumination, plastics, mechanical engineering, tooling, electronics and firmware, device drivers, application software, electronic registration, diagnostics, user-interface graphics and audio assets, packaging, and documentation. All these diverse areas were orchestrated by our producers/program managers.

The Internet Discovery Set and Me2Cam followed a similar development model. In early November 1998, after being presented with realistic cost estimates and a working prototype to communicate the concept, a focus group of parents unanimously decided that, although they loved the Internet Discovery Set concept, the price was simply too high for the perceived value. Our own insights into how complex it would be to develop this product to the full, considering the need for secure Web servers, custom kid-friendly browsers, and kid- appropriate and frequently changing Web sites, made for a quick decision. That was the end of the Internet Discovery Set. In the years to follow, more toy concepts were abandoned due more to product cost than to anything else.

And then there were two. The Computer Microscope and the Me2Cam.

FEBRUARY 1999: THE UNVEILING AT THE NEW YORK TOY FAIR

The International New York Toy Fair is where toy buyers meet toy manufacturers–where demand meets supply. Unlike major computer or electronics' tradeshows, the Toy Fair is not open to the public: rather, store chains that sell toys to consumers are guided through by appointment, and they provide initial estimates on how many units they expect to buy of a given product.

For the Intel Play line–and yes, two products do constitute a line–this was the first chance to see how the toy buyers would react to the products. Early working prototypes housed in plastic models of the real industrial design were demonstrated for two weeks straight. The reaction of the buyers was unanimous and overwhelmingly positive to both the $99(USD) QX3™ Computer Microscope and the $69(USD) Me2Cam* Virtual Game System–the full names assigned to these products.

What until then was treated as an experiment by both parent companies suddenly became serious business with a long road ahead to get products fully developed, into mass production, and launched. The rush to get both products out the door in the remaining six months was on.

SPRING AND SUMMER 1999: SHIPPING THE QX3 AND THE ME2CAM

The QX3 was ready in September 1999, the Me2Cam in October. It was a long summer for everyone at the Smart Toy Lab (STL).

During the summer, the STL was adopted into the Connected Products Division, which at the time had only the Intel® PC Camera and Create & Share product line. Full organizational integration was to happen gradually.

Meanwhile, a whole new development cycle, starting with brainstorming for new ideas for year 2000 products, was already underway. Again, the team was forced into invention on a schedule, but this time they had the added load of products under full development.

The QX3™ Computer Microscope and the Me2Cam have each won numerous prestigious product awards in a range of categories. The QX3 was rated the top-selling multimedia toy of the 1999 holiday season despite a higher price than most other products in this category.

Winter 1999 and Spring 2000: Intel and Mattel–Changing Companies

In late Fall 1999, business conditions started shifting for Mattel and for the toy industry as a whole. Mattel wanted to focus on its core: traditional low-tech toys with strong kid appeal brands. The Toy Lab had also lost its champions within Mattel during this shift, and the parent company's visions about the future of smart toys and the STL started to diverge widely. These differences eventually started to permeate all facets of the collaboration from the ideas about the kind of products to develop, to marketing and merchandising strategies, to how to go about growing the business, and so on. In May 2000, Intel and Mattel decided to go their separate ways and formally end the joint project.

Intel's Connected Products Division, being bullish on the potential of PC-enhanced toys, decided to continue the investment in the STL and take the Intel® Play™ toy line forward. Intel hired key personnel from the Mattel team to help maintain the momentum at the STL. Two toy designers and three producers joined the Intel team, along with a Mattel sales director, who had an excellent network within the toy and mass-market channels.

From the crop of new toy ideas and concepts created during 1999, two product candidates emerged as the Intel Play products for the holiday 2000 season.

1. **Computer Sound Morpher**. This is a $49(USD) take-anywhere toy that allows children to gather sounds and take them back to a sound-editing and creative effects studio on the PC.
2. **Digital Movie Creator**. This is a $99(USD) product that allows children to make their own movies. It comes complete with a portable audio/video camera and easy-to-use movie-editing software with tons of special effects.

The Digital Movie Creator became a casualty of the separation from Mattel. Trying to complete the development of this product while untangling the toy lab from Mattel was judged too risky. Instead, Intel-only STL focused on just the Computer Sound Morpher. Successfully launching this product would prove that the team could successfully develop the product without Mattel. Packaging, marketing, operations, and manufacturing responsibility were moved to their respective Connected Product Division functional organizations.

Fall 2000: Computer Sound Morpher

Intel completed the development of the Computer Sound Morpher in August of 2000. The breakup with Mattel left the newly independent toy group scrambling to pick up the marketing from Mattel. By the time new marketing experts were in place, it was too late in the year to have significant impact on the holiday 2000 sales season. However, with the three Intel Play products in the market: the QX3™ Computer Microscope, the Me2Cam* Virtual Game System, and the Computer Sound Morpher, Intel Play did start to look more and more like a true product line.

Year 2001: Digital Movie Creator

After three years of product development, it was time to look both backward and forward, and strategize where the STL should be headed. Where previously children aged 4 to 12 were considered to be potential target audiences for Intel Play products, the team then decided to focus on the 10 to 13 pre-teen crowd. These children are very familiar and comfortable using personal computers; in fact most of them have never known a world without personal computers. Ideal product concepts for this audience would need to be less about play as an activity in its own right and more about gear that fit naturally into the busy lifestyles of these young people.

Many of the concepts readied for 2001 did not fit this change in direction and were abandoned. The mothballed Digital Movie Creator from the year before, however, did

fit perfectly. It was dusted off and significantly refeatured and revised to include advances in low-cost cameras and trends in industrial design. It is the new Intel Play product for the year 2001. The extra year allowed the STL to make it a significantly better product for the same $99(USD) suggested retail price.

Going Forward

Since its release, people from a diverse range of disciplines and hobbies have discovered the capability of the QX3 Computer Microscope and have adopted it as a useful tool. Examples include science, stamp collecting, coin collecting, NASA's zero gravity clean room, forensics labs, archaeology, micropaleontology, circuit board inspection, and ophthalmology instrument inspection. New uses for this microscope are brought to our attention almost weekly.

The education community has also started to embrace the potential of both the QX3 and the Digital Movie Creator. Educators do not see these products as computer literacy items; rather, they see them as highly valuable and very affordable tools for improved science and social studies teaching. Curriculum development, teacher training, marketing, and distribution programs are in place to address the educational market segment. Intel Play products also have been introduced in the European and Asian markets.

CONCLUSIONS

Over the last three years, the Smart Toy Lab (STL) has matured into a fully staffed business unit within the Connected Products Division. This year, the combined efforts of this team have produced coordinated sales, marketing and merchandising efforts to broaden awareness of the Intel Play products, with the new Digital Movie Creator as the 2001 flagship product. The success of these efforts will come to light in the 2001 holiday selling season. Meanwhile, the team continues its efforts to bring innovative new Intel products into the lives of children. As part of Intel's corporate strategy, the STL clearly adds products to the Connected Products Division's consistent with the Extended PC directive, but it has also contributed a wealth of external design, sales, marketing, and development process experience (BKMs) to Intel's continued efforts in the consumer marketplace.

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AUTHORS' BIOGRAPHIES

Herman D'Hooge manages the Design Center for Intel's Connected Products Division. Prior to that, he managed New Concept Development at the Smart Toy Lab, which he co-founded in early 1998. During his 20 years with Intel he has held various positions in research, development, product architecture, industry evangelism, and management in areas ranging from multi-processor computer architectures, PC system architecture, operating systems, computer security, fault tolerance, distributed systems, computer telephony integration, and new computing applications research. He holds an M.S. degree in Electrical Engineering and an M.S. degree in Computer Science both from the University of Ghent, Belgium. His e-mail is herman.d.dhooge@intel.com.

Melanie Goldstein is Senior Program Manager at the Smart Toy Lab. She has over 10 years of program management experience in the multimedia and software development industry and was one of the founding members of the toy lab in 1998. She holds a B.A. degree in Political Theory from UCLA. Her e-mail is melanie.b.goldstein@intel.com.