EXECUTIVE GAMES INC.

Executive Games Inc. of Dorchester, Massachusetts became one of the leading producers of home video games by January 1976. The electronic games market flourished in late 1975 as a major development in the consumer electronics industry, following hand-held calculators and digital watches. Until then high costs had restricted video games to coin operated machines in public areas. Executive Games' president, Peter Stepanek recruited the engineering skills of a group of M.I.T. students to develop a less expensive version of these popular games.

The result of their efforts was the low cost "Television Tennis" game (described in Exhibit I) that captured a significant market share. Due to production difficulties, Executive Games had delivered only 6,000 units in late November and December 1975 but the number of backorders exceeded 400,000. In January, the management's chief concern focused on increasing production output and on dealing with the larger issue of increasing competition.

Background of Executive Games

Executive Games was incorporated in 1968 under the direction of owner Peter Stepanek. Games and novelty items, such as chess and backgammon, were the company's original product line. Foot-high chessmen and a plush checkered playing surface rug evidenced the unique and novel appeal of one chess set. By 1974, yearly sales had grown to $2-million and the company was on the verge of a major two-fold product expansion. Also, by that time Steven Stepanek had begun his association with his father's company and described the company's involvement in these two new areas in the following way:

> Shortly after I joined the organization, Executive Games initiated two new product lines, soft goods and home versions of "parlor*" games. Typical soft goods included articles like canvas bags. This particular market was attractive due to high markup, ease of manufacture and short turn-around. Also, once these bags are stitched and shipped out the door, there is very

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* "parlor" refers to establishments such as cocktail lounges, bars, billiard parlors, bowling alleys, etc.

This case was made possible through the cooperation of Executive Games, Inc.

It was written by Victor Tom, Teaching Assistant, under the direction of Robert T. Lund. It is intended as the basis for class discussion, not as an example of either effective or ineffective handling of an administrative situation.

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little that can go wrong with them. The novelty lies in the customizing names that the retailer can imprint on the bags. To this end, hot presses are sold in conjunction with the soft goods. Since the introduction of this product line in April 1975, dollar sales attributed to it alone were 1½-million by the year's end.

In 1975 Executive Games also introduced the home version of the air-hockey game. Previously this type of game was restricted to parlor and arcade situations by its size and cost. Peter made a killing on that game, but only because he sensed the market demand would rapidly fall off once the novelty wore off. Through carefully controlled reduction of inventory stocks, Executive Games showed large profits whereas another established toy manufacturer suffered when caught with sizable hockey game inventories. The market literally dropped to nothing after the Christmas buying season.

The next parlor-type game to be adapted to home use, "Television Tennis," was the first electronic product undertaken by Executive Games. Within the company we then had absolutely no design or manufacture expertise in the electronics area. In fact, I didn't know the difference between resistors, capacitors, and I.C.'s.

But Peter had strong feelings that the TV game was going to be important in the future. The "Television Tennis" game's development was attributable to Peter's newly-found association with the M.I.T. Innovation Center.

Involvement of M.I.T. Innovation Center

The M.I.T. Innovation Center was a unique laboratory for aspiring young inventors that had been established with grant assistance from the National Science Foundation. Students worked on developing new products, ranging from mechanical banana peelers to precision electronic capacitance meters. It was in this laboratory that the "Television Tennis" game originated and was brought to a successful realization through the engineering efforts of Glen Dash and his fraternity brothers. Said Prof. Y. T. Li (the Center's director) of the game's development during a press interview: "Our success is very amazing, a dramatic outcome." Mr. Lamar Washington, general manager of the Center, recalled the fortuitous events surrounding Executive Games' introduction to the group at MIT and the start of their collaboration.

The concept of electronic games was not a new idea at M.I.T.; it had been around for some time. In our own laboratory we had a student developing circuitry for a global game, one that dealt with many world problems, but it was too complex ever to be a marketable product. That one minor project was the extent of our electronic game involvement until we met Peter Stepanek.

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During the month of January 1975, a Wall Street Journal representative visited M.I.T. in order to write an article on the Center's progress in fostering innovation. He was given a tour of our ongoing projects and the electronic game development apparently left a strong impression, because the January 22 article concentrated on this topic. Had I known this in advance, I might have tried to edit it out, but as things turned out, the article proved very fortunate for us. Shortly after its publication, I received a call from Peter Stepanek and in this initial contact he expressed strong interests in funding an electronic game development. But his idea of a game was a simpler one of an image of a moving ball and movable paddles on a TV screen. We scheduled a meeting at M.I.T. several weeks later. To expedite this project, I asked Glen Dash and four of his fraternity brothers to take on the job. In those weeks that followed, Glen and crew designed and demonstrated a crude bouncing ball display on an oscilloscope for the upcoming meeting.

The first meeting between representatives of Executive Games and the M.I.T. Innovation Center took place in the first week of February. Those present included Peter, Prof. Li, Glen and his team and myself. Peter opened the meeting expounding on the virtues of being in business for oneself, and then later outlined his current primary objectives. He wanted us to develop an electronic parlor-type game that could be played at home on one's own TV set, something like the coin operated electronic tennis games played in amusement areas. He evaluated the potential market to be enormous but only if we kept parts costs under $25.00 per unit. To show he meant business, he had brought with him a blank check to be made out for development funds. Initial development funds were estimated to he $25,000, a figure later revised to $40,000. A preliminary contract was drawn up and agreed upon by both parties.

Product Development

Glen and his four fraternity brothers worked on a circuit design based on standard off-the-shelf integrated circuits (IC's). After extensive experimentation and clever engineering, they came up with a unique, simple patentable design and a workable game. When asked about electronic game design and consumer electronics in general, Dash revealed why he thought they were more successful.

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> Consumer electronics badly needs good engineering. The better engineers, however, tend not to work in this field because they aren't going to work for nickels and dimes. That's why the present electronic games are either too expensive or poorly designed, not sophisticated "state of the art" designs. National Semiconductor offers a comparable game for a much higher price. Magnavox's Odyssey, is of dubious quality. It seems the only immediate serious competitor is Atari.

Once the basic Television Tennis game had been designed, the formidable task of achieving a $25.00 parts cost had to be overcome. During late spring, Dash continually modified the design in attempts to cut costs wherever possible. Concurrently Lamar Washington, who secured the latest price quotes from potential suppliers, reviewed the total parts cost daily. Dash recalled his interaction with Washington during this critical period.

> At first, we didn't think we could make the $25.00 goal. Washington kept track of the current prices of all components on his blackboard. As each day went by, we made minor design revisions, vendors came back with lower prices and we slowly whittled the parts cost down to the $25.00 level. By the end of May, we had arrived at an optimal architecture for the Tennis game. I graduated in May and I left M.I.T. to work full-time with Hewlett-Packard.

Despite Glen's departure, the development of the Television Tennis game progressed through the summer. A final debugged prototype was ready for full evaluation by mid-July and a printed circuit board version was finished by late August. Also during the summer the plastic housing design was completed. In September final vendors were chosen and tooling-up operations were started. Manufacturing was to be done in Executive Games' Dorchester plant. The plant required little manufacturing machinery but test jigs had to be designed and built and, in another of Stepanek's manufacturing plants molds for the plastic housing had to be made.

During the month of October, Glen left Hewlett-Packard to become Chief Engineer for Executive Games. At this time his most important assignment was to characterize and minimize the amount of high frequency radiation emitted by their electronic game. The Federal Communications Commission required video

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games to be certified that they did not radiate interference when attached to the antenna terminals of television receivers. In Glen's opinion, the certification requirements were vague. He thus conducted exhaustive tests on a prototype game at a special laboratory designed for high frequency measurements. After minor modifications and added shielding, the emissions were reduced to a tolerable level Full documentation on final tests was thoroughly written up. In total, this activity lasted ten days. In Washington D.C., the tennis game passed the FCC certification requirements on the second trial.

A major production obstacle arose in late October. Having severe integrated circuit (IC) fabrication difficulties, National Semiconductor was forced to cancel Executive Games' first shipment of low-power transistor-transistor-logic (TTL), a class of IC's used extensively in the tennis game. In the following, Glen described the changes made necessary by this cancellation.

> We were supposed to be in full production within a month and then all of a sudden National notified us that they couldn't supply us with low-power TTL, the very night before the shipment was due. Without any other recourse (low-power TTL was not immediately available from other vendors), we spent the next couple days working evenings and through the weekend modifying the design to be based on CMOS technology (another class of IC's). When this design was finished, National reneged a second time, and could not ship CMOS. We did another and final redesign based on a Low Power Shottky circuits, which were readily available. In total, this redesign period took us about ten days.

Full scale production commenced on November 28th. Initial production output was only a few games per day, building up to 300 per day by Christmas. At the end of the year, cumulative shipments totaled 6,000 tennis games.

A trade Journal article describing the development of home video games up to November 1975 is reproduced in Exhibit 2.

Marketing Strategy

During the same period that Glen Dash and his fraternity brothers were developing the tennis game design, Peter Stepanek was focusing his attentions on marketing the game. From April through June Mr. Stepanek brought buyers from large retail houses to M.I.T. for the purpose of making direct sales. Following game demonstrations, many buyers placed immediate orders or returned with their superiors to conclude pur-

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chase agreements. In this manner, Mr. Stepanek had accumulated 400,000 orders on paper by July and had impressed on the M.I.T. group that the electronic game had a large market.

Mr. P. Stepanek described his marketing philosophy for the electronic TV tennis game.

> I know nothing of electronics, but I do know how to merchandise and market. The electronic tennis game was received by top retailers as a dramatic innovation, but we had to be careful to whom we sold. For instance, when Sears' buyers approached us with a potential buying order for millions, I turned them down. Sears' requirements are so large that their orders would absorb 100% of our production output, essentially enabling them total control over our game sales. On the other hand, discount houses would buy large quantities, sell furiously for one season, and then destroy the price structure when game sales decline. Our best strategy, was to go after the first-line retailing stores like Jordan Marsh.

Using this strategy Mr. Stepanek directed his sales campaign to the major department stores and chains that featured first-line merchandise. Firms such as Jordan Marsh, May Corporation, Dayton-Hudson, and Marshall Field, covered a broad geographic base. Mr. Stepanek believed that these non-discount houses would give the product a 'good ride' at retail. No test marketing was attempted nor required by these stores. For rapid evaluation, however, Mr. Stepanek distributed the first 2,000 games in the immediate Boston area.

Mr. Stepanek's awareness of the merchandising value of product features was illustrated by an incident which occurred while the game was still under development. As told by Washington:

> To keep the ball in play on the TV screen while he worked on the circuits, Glen and one of his fraternity brothers, David Agans made a slight circuit modification which caused one paddle to follow the ball and automatically hit the return. On the other side of the "net" he could control the paddle or set up a practice wall (an added feature enabling one player to play against a wall). A ball could be kept in play indefinitely by the combined use of the robot arm and practice wall.
>
> On one of his many M.I.T. progress visits, Peter noticed the robot arm and realized its potential advertising and display value. He advertised this feature as a unique merchandising gimmick to prospective buyers. When it came time to demonstrate this feature on a final prototype, he discovered that the circuit modifications had been removed

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> after the engineering had been completed. After Peter explained its potential value, Dave Agans restored the robot arm in a matter of minutes. Subsequently he incorporated it as a standard feature.

A mode of operation frequently found in store window displays involved the activation of both the robot arm and practice wall. In this manner customers could view the action of the ball and paddle on the TV screen without having anyone actually play the game.

Financing Production

Start-up financing was arranged by Peter Stepanek. A retired executive of Bali Bra, he then owned four companies and had a well-established credit line. In regards to funding the tennis game operations, Mr. Dash stated succintly,

> A lot of problems go away if you have financial push behind you. Stepanek knew what to do and who to go to in order to secure lines of credit.

Total costs involved in developing and bringing the Television Tennis game on-line were approximately $330,000. Engineering development costs totaled to $40,000 and manufacturing tooling represented another $40,000. Working capital needs were projected at $250,000 to fill the pipeline and keep operations running smoothly. Finally there were some fees paid to Underwriters Laboratories (U.L.) and the F.C.C.

Mr. Stepanek took full advantage of the marketability of the electronic game to begin operations. He got buyers sufficiently interested to guarantee orders and to give him letters of credit. He then consolidated these letters at a large reputable hank, from which he received one letter of credit that satisfied his suppliers.

Manufacturing Facilities and Labor

Executive Games' main plant, a three-story brick building, was located in Dorchester, a ma]or section of urban Boston. This location afforded low

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overhead costs and provided direct access to the Boston subway system. The shipping and receiving department and an adjacent stock room occupied the ground floor. Manufacturing for soft goods and electronic games were located on the third and second floors respectively. On the second floor Television Tennis games were assembled on long tables. Manufacturing equipment included soldering irons, fans (to blow solder smoke away), ohm-meters, test-jigs and TV sets.

Manufacturing labor was hired locally, and as seen by management, the supply of unskilled labor in that area did not pose a problem. Assemblers were paid minimum wages ($2.35/hour). There was some difficulty in training the unskilled people to become proficient solderers, since this skill was locally unavailable. Solderers were paid $3.00/hour. As of January 1 there were 65 assemblers, 35 solderers and 8 technicians in the Television Tennis assembly workforce. Technicians were paid $3.00/hour plus an additional $.50 per repaired circuit board.

Manufacturing Process Flow

All purchasing and final assembly was handled by Executive Games but the task of printed circuit board assembly was subcontracted out to Universal Instruments since they had the equipment and expertise in the area of automatic component insertion. Universal received all components and empty PC boards from Executive Games, assembled the components on the boards, and then shipped the boards to another location for finishing. At this second location incoming boards underwent wave soldering, hand insertion and soldering of additional components and final testing. Inspected boards were shipped to Executive Games, Dorchester, where the good boards entered the production line and faulty boards were given to a trouble-shooting group for rework. Following repair of these boards by technicians, they were returned to the main production line. Plastic moldings far the game's housing and player controls were done at another of Stepanek's manufacturing plants and shipped to Dorchester. The production steps at Executive Games, Dorchester, were:

1. Incoming inspection of good assembled boards. A test jig supplied the necessary power and controls to the board under test allowing proper operation of the tennis game to be displayed on a TV screen. This step screened out those circuit boards which

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became defective during shipment from Universal.

2. Soldering of connecting wires between the circuit board, switches on housing and player controls (two handheld potentiometers). This intermediate assemblage comprised four major components interconnected by wires.

3. Assembly and soldering of antenna boxes. This box connected the TV antenna terminals either to a TV aerial or to the Tennis game electronics.

4. Power cord assembly.

5. Incoming inspection of power supply transformers. Proper impedances were checked.

6. Soldering of remaining electronic components and wires to main assembly chassis.

7. Preassembly test. Unit to be tested was connected to a TV set and full functionality was checked.

8. Final assembly. The circuit board was fastened to the housing and the bottom plastic cover plate was screwed in place. Finishing decals were applied.

9. Final test. Pull functionality was again checked on a TV set.

10. Packaging

Total turn-around time from receipt of components to shipment of finished goods was initially 120 days. See Exhibit 3 for a diagram of the flow of product from supplier to Executive Games and to retailers. Universal's inability to produce sufficient numbers of good tested circuit boards further stretched the manufacturing time. In comparison to the soft goods line, Steve Stepanek stated,

> The soft goods throughput time is typically 3 weeks, whereas in the electronics product area, the pipeline is longer, so you need much better planning, typically 8 weeks or more. In the first case we buy material, sew it up and ship the product out. But for the tennis game, we purchase electronic components, deliver them to Universal, receive the finished boards, send them down our assembly line, test the final product, and then ship them out.

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In January total manufactured costs of the tennis game amounted to $22.00 for parts including the work done on the boards an Universal, and $6.00 for manufacturing labor at Executive Games. Adding on 5% M.I.T. royalties, the manufacturer's price was set at $42.00 with a suggested retail price of $65.00.

Payment terms with stores were 30 days from receipt of goods and similar arrangements were made between Executive Games and its suppliers.

Production Output

Of the first 6,000 TV Tennis games produced and sold, fewer than 2% failed in the field. On the Executive Games' assembly line, the games exhibited less than a 6% failure rate. Considering the fact that no burning testing of the electronic components or assembled board was performed, the management thought that these yield statistics were highly acceptable for an electronic product. Defective games were returned to Executive Games for rework or parts salvage.

In January, the management of Executive Games viewed lower than expected production output with increasing concern. Emphasis had shifted from problems of engineering development to those associated with production in quantity. Glen Dash summarized the situation at hand.

> Our only problem now is that we can't make enough games. To catch up with sales, we would have to produce about 3,000 games per day.

Maximum production capability at the Dorchester facility was limited to 1,800 games per day utilizing two work shifts. No manufacturing was done on weekends. One production constraint was evident in the number of hand-soldering operations required of each game assembly. But a more immediate and severe station was Universal's inability to deliver finished boards. Universal was only able to supply 350 of the expected 1000 per day. From an engineering viewpoint, the high circuit board complexity may have contributed to production problems, specifically whenever faulty components had to be isolated and replaced. As indicated by Steve Stepanek, future electronic products manufactured by Executive Games would utilize quick fastening connectors to eliminate hand-soldering and better designed circuit boards to facilitate repair.

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The possibility of contracting additional electronics firms to increase assembled board production was considered. A large electronic components supplier asked to be Executive Games' supplier for the entire electronic circuit package. They would provide the components, assemble the boards and then test the final circuit package. Upon receipt of the finished circuit boards at Executive Games', payment would still not be required for 30 days. Due to internal difficulties, however, this component supplier withdrew the offer.

Other supply houses offered similar arrangements but per board costs were too high. One company quoted $24.00 per assembled circuit board whereas current board costs were only $14.00.

In light of a backlog of 400,000 TV Tennis game orders and December production rates of less than 500 games per day, Executive Games was forced to restrict all new orders for the coming year. As a result many large stores could not buy enough electronic games to satisfy their present demands. In one instance. a major national merchandising firm approached Peter Stepanek to place an order for 100,000 tennis games. Although the buyers offered $5 advance payment for each game and a 3 million dollar sight draft, the final order had to be restricted to 10,000 units.

Competition

During the 1975 Christmas selling season, several companies were marketing video games for the home. Only two, Magnavox and Atari, were considered serious competitors, offering games under $100 retail. Exhibit 4 depicts the variety and price range of games available at that time. About their own TV tennis' price tag, Mr. Dash commented,

> Peter was a good retailer and knew the prices required to knock out our competition. Whenever somebody quotes a price, they try to match our price.

Electronic trade journals, however, were predicting that in 1976 TV games would really begin to proliferate. Companies becoming involved in video games manufacture would include semiconductor manufacturers, television and consumer electronic manufacturers, and Far East assemblers as well as traditional arcade

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and toy companies. Said one representative of the toy industry,

> The electronic game business is a game business. You must understand the consumer and the game psychology better than the electronics.

From another point of view, an executive of a semiconductor house stated,

> The company that will dominate the business will be the one that combines low cost and a wide range of game options.

In an attempt to become a key component supplier to the growing number of game companies, General Instruments developed a dedicated large scale integrated circuit (LSI) chip for home video games. This one integrated circuit replaced most of the printed circuit board and its discrete components. This chip was intended to permit companies to develop and manufacture video games with minimal electronic circuit design on their part. Additional features included on the screen electronic scoring. It's estimated cost was $5 to $6 depending on quantity ordered. Full scale production had just begun with first shipment expected in early 1976. Other large semiconductor houses were expected to develop similar chips.

An alternative route undertaken by some game manufacturers was to contract with one of the major semiconductor firms for a custom-designed LSI chip. These developments were costly in both time and money. Typical one-time development costs ran $30,000-$40,000 with the actual per chip costs dependent on die size and quantity ordered. It would have cost $5 to $10 per chip to do Television Tennis in LSI, assuming a quantity of 500,000. Development schedules spanned 9 months or more. This assumed a working model had already been developed and the design frozen. Last minute changes were prohibitively expensive, in time and cost.

The Future of Executive Games

In the midst of expanding competition, Glen Dash perceived the role of Executive Games as an innovator in video games.

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> Executive Games is a novelty company. And in this area (electronic games) we estimate product lifetimes to be about one year. Looking downstream we recognize that we can only stay in the business by engineering new game ideas.

Elaborating further, he hinted at same of the future developments expected to come out of their design group.

> By smartly engineering with microprocessors we hope to put a dent in the market of these LSI-based companies. The disadvantage to a discrete component game is that somebody will do it in LSI eventually and underprice yours. Microprocessors, being programmable, could provide us products with longevity.

Costs of standard off-the-shelf microprocessors, however, were not commensurate with those of equivalent TTL circuits. But microprocessor prices were expected to continue dropping making their usage in home video games economically feasible by 1977.

Regarding their long range plans, Steven Stepanek expected Executive Games to continue growing and possibly over the next 5 years to reach 20-30 million dollars in sales per year. In order to achieve this goal Peter Stepanek realized that new products would have to be generated, and M.I.T. would be an invaluable source for new product ideas in the area of consumer electronics. Already, a new hockey game and a home smoke detector were products on the horizon.

In light of competition and stated future goals, the management of Executive Games was faced with a dilemma in January of 1976. Due to limited engineering manpower, they could either focus their efforts on increasing the profitability of the present product (Television Tennis) or continue production as is and concentrate on developing new electronic products. A Television Tennis circuit board redesign to facilitate troubleshooting could result in more output and reduced labor costs. Also additional electronics houses could be contracted to assemble P.C. boards and increase total output. In order to capitalize on the 400,000 backorders, Executive Games would have to increase production to fill these orders before the competition introduced their new lines of games. On the other hand, the

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engineering staff could devote their time to develop novel new games and products. In this manner, they could "skim the cream off" new markets by staying one step ahead of their competition.

Peter Stepanek was the person who would have to make the ultimate decision, but during the course of this development he had given a large amount of responsibility to the student engineers.
In Glen Dash's view:

> Peter will continue to lay down our strategy as he has done in the past. It's easy, once he decides exactly what he wants to do. We then fill in the engineering gaps.

Exhibit 5 is a copy of the company accountants' operating statement for Executive Games for three month and five month periods ending January 31, 1976. The figures include revenues and costs for all products in the Executive Games line. "Manufacturing Expenses" include direct labor and manufacturing overhead.

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