Intel Crush Oral History Panel

William Davidow, Regis McKenna, Richard Bader, Dave House, and Jeff Katz

Moderated by:
Dane Elliot and Rosemary Remacle

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Dane Elliot: This is Monday, the 14th of October, and we are doing an oral history with the Crush Steering Committee. My name is Dane Elliot. I'll be one of the interviewers.

Rosemary Remacle: I'm Rosemary Remacle, and I will be the other interviewer.

Regis McKenna: I'm Regis McKenna. I was the president of Regis McKenna, Inc. We did the advertising and public relations for Intel from 1981. And I was invited to join the original Crush Group when it was formed in 1979.

Rich Bader: I'm Rich Bader. I was a product manager for the single board computer group, the multi-bus group, and got to be their representative in the Crush steering committee.

Jeff Katz: I'm Jeff Katz. I was the product manager for the 8086 and therefore the main culprit, also the main beneficiary, whose product line hadn't taken off and had suddenly gotten a lot of competition. As part of the steering committee that set it up, I also devolved into the chief bureaucrat to operate all the nine programs and coordinate all the program leaders.

Dave House: I'm Dave House. In '76 I became marketing manager for micro-processor and peripheral components, working for Bill Davidow, and later for Les Vadasz. And in 1978, I became general manager for that division in charge of microprocessors and peripheral components and embedded controllers product lines. So I got enlisted very early when the corporation launched the campaign.

Bill Davidow: And I'm Bill Davidow. And at the time of Crush, I was running the microcomputer systems division. And I was the member of the executive staff meeting who got tagged with running the program.

Dane Elliot: Crush was the first and clearly the most significant comprehensive marketing campaign in the history of the semiconductor industry. It commenced at the end of 1979 and continued for a year, ending as 1981 began. It was initiated when Intel field sales brought the issue of losing design wins to Motorola and Zilog that they felt should have been Intel's selling the 8086. The form of the notice was a telex from Don Buckhout, an Intel NY District Sales Manager working for Casey Powell to the Intel executive staff decrying the losses to the competition.

Dane Elliot: OK, first question. And this one really goes, to Bill and David. But anybody else who has any comment should chime in. And that is: what was the market and competitive environment like or perceived to be by Intel before the initiation of Crush?

House: Maybe I could open with that. The 8080 8-bit microprocessor was launched in May of 1974 and had become hugely successful. The 4004 and the 8008 that preceded were not commercial successes.

But the 8080 got in the market and Bill Gates is writing basic for it, and it starts becoming an important product. But the 8085 which followed the 8080 really took second seat to Z80 from Zilog.

And we were having problems relative to that. The 8086 was our answer. The 8086 was Intel's 16-bit microprocessor and what we found by this time and I'm sure we'll talk about this was that Motorola was selling the 68000 and Zilog was selling the Z8000, and we were commonly coming in third with the 8086 when it came to design win choices.

Davidow: I remember thinking about the 8086 and how important it was, we thought, to have some level of software compatibility. The 8086 architecture and instruction set supported the 8080 and 8085 instruction-set, which was perceived as a compromise. The 16-bit products from Motorola and Zilog were relatively uncompromised with features from earlier 8-bit microprocessors. I had been running marketing for Hewlett Packard's computer division, before I came to Intel. And at Hewlett Packard, when we introduced the first mini computers, they were the largest, slowest, heaviest, and most expensive minicomputers with the worst architectures.

I thought, boy, I'm right back in the same situation again at Intel. So, I perceived of a sort of malaise and that we were sort of going to have to pick at the bones in order get as many design wins as possible.

Katz: I'd like to add a little bit about that market situation at the beginning of the Crush campaign effort. For the couple of years prior to that, the 8086 at least starting a couple of years prior to that-- 8086 had been the first 16-bit microprocessor.

It got a lot of play in the press, and a good number, we thought, of design wins, but not much business because 16-bit processors took a lot longer to develop than 8-bit ones did. I was under the gun as product manager for getting some revenue for a change.

House: And we were late on the peripheral components that complemented the 8086.

Katz: The peripherals weren't all ready. But finally, by '79 or so, we were doing OK with what we thought was a good set of design wins. But about that time, after a couple of years in the marketplace, the competition had a chance to do what they thought were better architectures. And the customers were buying that story. So the pressure was on me to do better with what I had.

Elliot: Why where the competitive architectures perceived to be better?

House: Well the critical thing was 64k memory segments, a 16-bit address versus a 32-bit address. The 68000 had several things going for it. One was the 32-bit flat address space. The programmers loved that. It had a general-purpose set of registers. It was sort of VAX like, so it was familiar to them. Where we had been constrained in the 8086 architecture by two factors.

> One is the 8800, which later became the 432, was our official next generation product. The 8086 was really developed as a stopgap.
>
> Second, we had to be culturally compatible with the 8085. It wasn't binary compatible and we advertised a translator program to take 8080 or 8085 source, or assembly code, and convert it to binaries for the 8086. So the critical things were the 64k memory segments, 16-bit address pointers and lack of a general purpose orthogonal register-set.

Elliot: So any engineer who understood minicomputer architecture was going to appreciate what Motorola and Zilog had to offer!

House: Exactly.

Bader: The software guys!

House: The software guys?

Bader: In the Multibus business, we were actually building a very successful business using 8086 based boards, much more successful, higher price points than what we'd seen in the 8-bit market. There wasn't the same level of board competition from either Motorola or Zilog. So if an engineer was looking for that level of systems solution, we would dominate the design decision as opposed to the software guys. We were doing pretty well with board-level design wins and volume production.

House: If I recall correctly, in the beginning of '78, the development systems business and board business was bigger than the component business, and certainly far more profitable, because the component business wasn't profitable.

Regis McKenna: But we're also not talking about a huge volume market.

House: No.

McKenna: These were really the early, early days of the microprocessor.

Rosemary Remacle: Bill, you described a sense of malaise, I think you said, in the executive staff level? What was the feedback from the field then? What kind of, maybe you're not the right person answer, possibly somebody else at the table, but what was the process by which the factory gathered feedback from the field and decided what to do about it? What role did the field play in strategic planning or even tactical planning inside the factory?

Davidow: Well, we were hearing field objections. But even while we were hearing field objections one of the jobs of marketing is to take what you've got and sell it. And there was not a lot that we could do in terms of changing the products. And then we got the famous “eight-page telex” from the field, from Don Buckhout, that said, the field is depressed. Everywhere you go, we're losing business. There's no way we can win with this product. And this is really going to be important for Intel, so you guys better get your act together.

Remacle: So what was the reception in the ESM when you walked in there with that?

Davidow: As I remember the process, I took the eight-page telex, copied it, and I handed it around in the ESM. I announced that my business was dependent upon 8086 design wins. We weren't getting them. And the microprocessor guys were killing my business; that they were acting like a bunch of whipped dogs. And why didn't they go out there and do something about it and fight?

And there was a little bit of a discussion after that. And Andy looked around the room, and he said to me, you solve the problem. And that was how “Crush” got started.

Remacle: How did it get from that point to a formal effort, when were you going to get a group of people together in a room, get the name, get the plan in place. What were the next steps after that ESM meeting?

Davidow: Well, Intel was a very small, top-down managed company. We could turn on a dime. I left that meeting thinking, well, my career is on the line here. And if the microprocessor system division fails, I don't have another job lined up. And I get excited about marketing kind of challenges.

I had seen a similar type of marketing challenge at HP, and I realized that, at that point, I remember going down to the Los Angeles sales office, and the guy who was there telling the people that worked for him, they all came into the sales office at the end of each day, to tell one another about what they had done and how good it was going or, “positive things”. And I thought, all right, that really worked in LA, so why don't we just try the same thing at Intel? And I then called a meeting. And we got started.

There were eight members of the Crush Steering Committee Dave House was there, Jim Lally was there, and Regis McKenna, Jeff Katz, Richie Bader, Casey Powell and Don Buckhout, author of the telex, joined us. And we all sat around the table and said; what are we going to do? It turned out that we only had one option that was to sell at a system level, because we were worse at the component level but we had all of these other things going. I remember thinking to myself, if we can position ourselves around the fact that this is the most important technical decision the corporation we are selling to will make for the next decade, we can talk to people at a very, very high level, and talk to them about the amount of engineering time involved, how total system cost will be less because we will have all these peripherals, how you'll be able to write your software faster, we could focus the selling processes in our favor.

Katz: Time to market.

Davidow: Time to market, all these things.

House: Development costs.

Davidow: And we had those discussions. And all of us were looking for advantages; that's how Crush got started.

Remacle: Did the steering committee already know each other and work well together?

House: I remember that meeting, Lally going to the blackboard, or white board, or whatever it was, and writing down strengths and weaknesses, and pulling ideas out of the group. We had a big idea exchange there and out of it came the realization that we were letting the competition set the rules of the game. We were letting the issues be about address space and register sets, about the architecture where their strengths were.

And the decisions were being made by the software engineers increasingly, and not the hardware engineers. We were losing at that level. Yet we had the compilers, and the debuggers, and the in-circuit emulators, the blue box, the Intel development system. We had the board level products. Our peripherals, no matter what their state, were much better than Motorola and Zilog's peripherals. At least we had partially working chips. They just had data sheets with no parts at that point in time.

We had credibility in that part of the solution. I really give credit to Bill and Jim saying, saying we've got to change the rules of the game here. We've got to make this about the system level sell and the solution. We need to sell higher in the organization. We've got to stop trying to win at the programmer level. And we need to win at the VP of engineering and the CEO level.

Bill, I remember you saying, “This is the most important decision our customer is going to make in the next decade. This is not a software engineer decision. This is a CEO decision.” We need to convince the customers of this.

McKenna: And Bill, you did write several articles on that subject, quite frankly, they really were addressed to the top management, and we started talking to the business decision makers at our customers.

HOUSE: He was part of the PR campaign.

McKenna: Right. Right, talking about the benefits of the designing with a systems level architecture.

House: And this was an important to decision for your corporation.

McKenna: Right.

Katz: I was about to fill in the gap between writing articles and executing the program, and the original genesis. There was this week of intense meeting, with eight of us; the five here at this table, Jim Lally, Casey Powell and Don Buckhout.

Katz: All around the table and in the conference rooms, mostly at Intel's then building number six, which was the system headquarters, where we just threw all our ideas on the table and on the wall, and discussed them and discussed them and then went home at night after 12 hours, and come back the next morning and do it all over again based on what we thought of while we were sleeping.

It was a very intense process of idea creation, which culminated after a week with a presentation to the executive staff to say, here's what we think we need to do in this program, with nine different sub-programs. And it was a lot of money, including some of the sub-programs with the most expensive advertising and travel campaigns that we'd ever done.

Remacle: Ballpark number?

Katz: Ballpark number? I believe it was like $2 million on ads. We'd never spent more than a couple hundred thousand dollars. Does that sound familiar to you?

McKenna: Yes.

Elliot: Was Don Buckhout at the steering committee meetings?

Katz: He was not a part of the physical group, but he was on the phone, as I recall.

House: But Casey was Don's boss, wasn't he?

Katz: Correct. And I think Don had some other reasons he couldn't be there at the meeting, and Casey came. I don't know if he just liked to be in California, or if he really was Don's representative or boss.

House: He was very urgent about the problem. He was very vocal about the contents of Don's telex.

Katz: So having done the executive staff sell, we got the nod. And they said, OK go do it. We'll spend the money. And then we had to go back to have another series of meetings to prepare the rest of the company for it.

House: Because Christmas was coming. And we had a real sense of urgency that we had the holidays coming, and people were going to be gone, and how were we going to get this ready and get this launched?

Katz: I had to cancel my ski trip between Christmas and New Year's to sit around a table with the same set of folks, architecting the program to be or the presentation to kick it off to the rest of the company right after the first of the year.

Remacle: How contentious or collaborative, that’s kind of two ends of the spectrum were those meetings?

Bader: I remember them as incredibly collaborative. It was an amazing coming together of folks that knew each other, were acquaintances, but we'd never really done a lot of work together before.

House: Bill, and Don Buckhout, and Casey Powell had convinced us that our life depended on it. This slide from that time, we can't remember what presentation this came from, says Crush, the purpose: To establish a sense of urgency and to set in motion critical, corporate-wide decisions and action plans to address a life-threatening competitive challenge. That's, I think, what really brought us all together. We felt that our careers and our company were at stake.

McKenna: There was much more analysis in the meetings than fighting back and forth over what should or shouldn't be done. I think it was trying to understand the problem and understand what the strengths and weaknesses were of the competition, as well as the strengths and weaknesses of Intel. How do we address our strengths versus their weaknesses? And what might we do in order to essentially present that to our customers?

Remacle: So there was $2 million for ads, but there were a whole lot of other things that I heard you talk about. Where did the rest of the budget come from?

House: I don't remember how much budget there was, but we basically had pretty much a blank check.

Katz: Well, that's true. Whatever we said and attached the word Crush to, was able to be done! The biggest other expense was the sales incentive program, the design win incentive program.

Elliot: That was a little controversial.

Katz: We promised that the sales folks who got their quota of design wins and were able to help their peers get their district's quota of design wins would be offered a trip to an exotic location. We thought of various exotic locations and finally ended up with Tahiti.

Remacle: Very non-Intel at the time.

Katz: We expected maybe as much as half of the sales force might get through it. And we figured out the budget for that, which would have been close to a million dollars, added. But it turned out that it was such a good incentive that like 98% of the sales force went to Tahiti, and none of the factory guys got to go, because the budget was overspent. And that came out to be another close to $2 million.

McKenna: I think one of the things that are critical here is to recognize that Intel was a component company. They were making memories. And the semiconductor memory business was a component business. And people like Bill and Dave came in from HP and Honeywell. And they were really brought the systems mentality.

House: We came out of computer companies.

McKenna: You brought the systems mentality.

Bader: I did too.

House: All of us have computer systems backgrounds. None of us were semiconductor physicists.

McKenna: And that was; you were sort of a fifth wheel for several years there. And then, as you brought this “systems mentality” into it, it all went into this meeting.

House: Bill was critical to this systems, tools and software perspective even in the early days.

Davidow: The thing I remember that still amazes me, I suspect that Intel was a $500 million to a billion dollar company at that time. I don't remember exactly how large it was. But everybody got on board. And this was something that was done at a staff position. There was no line authority within the group. And the marketing managers from other divisions had to change their budgets to be supportive of the program.

I remember Bob Derby doing that. And then I remember that Andy Grove and Bob Noyce standing up in front of the company and saying, we are going to do this. We're committed to do this. And we support it. I had never seen a situation, in what was a large company, where the whole company got turned on a dime to do this.

And I think that's one of the things that was amazing about Intel at that time. That it was so apolitical, and that so many people were committed to the success of the company, that somebody like an Andy could say, hey, let's all go this way, and everybody sacrificed their own little fiefdoms to support this effort. That was something that made Intel very different.

Remacle: And as I recall it was the MBO process was used to take it down into the trenches.

House: Like everything at Intel.

Katz: Virtually every operation of the company.

McKenna: And then there were regular weekly meetings which this you came in with your ARs. And God help you if you didn't follow through, align them with overall corporate objectives and complete them.

House: You had to stand up in front of your peers and expose yourself, whether you'd got your action items done or not.

McKenna: I think that process was just marvelous, so everything constantly moved forward.

Katz: As the chief bureaucrat, I called the weekly meetings for each of the nine programs. And they were all watching each other. And then a monthly meeting in front of the executive staff to say what we'd accomplished that month, that previous month. In Andy's book, it said, whatever you watch gets well. We watched it pretty closely. It got well.

Elliot: I was recently listening in another interview. One of the individuals was asked what he did or was he part of Crush? And his answer was interesting. Thirty-two years later, he said, everybody at Intel was part of Crush. If you worked for Intel at that time, Crush was your only focus.

House: I remember the DRAM guys, and the EPROM guys, and the static RAM guys trying to be part of Crush, trying to figure out what their role was in Crush.

Katz: The memory systems guys?

House: The memory systems guys, of course EPROM was very critical, because it allowed programmers to change programs frequently when debugging and becoming a production vehicle actually. The static RAMs were used more with microprocessors than anything. The DRAM guys were busy trying to figure out how they fit in. But everybody was part of it.

Remacle: Can somebody talk about how Crush, how it got that name? And what the legal department's response, and the field's response to it too were?

Davidow: Well it was Jim Lally's idea. And it was based on the fact that the Denver Broncos had this very good, I don't know but I think it was an offensive line, but it might have been the defensive line that was just tearing up the opponents.

House: And they had orange uniforms.

Davidow: And they had orange uniforms. And Jim says, let's make it Crush. And that spread throughout the whole corporation. It was also a popular soft drink.

Remacle: Check Rich's shirt Jeff, get the idea?

Bader: The official, illegal, shouldn't wear it in corporate headquarters, shirt. And it was Orange Crush. This terrified the legal staff.

House: The team was called the Orange Crush. The front line was called the Orange Crush. And so it became Crush.

Katz: Which was a play-on-words against the popular soft drink.

House: Which was Orange Crush. And therefore the Orange Crush, Intel 8086 Crush was to crush the Motorola 68000 and the Zilog Z8000.

Davidow: But Roger Borovoy went crazy, because he thought of the antitrust implications that we were trying to annihilate competition.

House: We thought that was a good idea. But he was chief legal counsel. So the t-shirt got banned. And it still became Crush. The inside slang word was the Crush campaign, but we weren't able to call it that publically.

McKenna: Of course at that time it was a bit presumptuous on their behalf, wasn't it?

House: That we should, at that time, be guilty of antitrust.

Bader: I think the observations about the system selling and the fact, I wasn't aware either, that all of us had computer company backgrounds.

McKenna: Of course, I was working with Apple at the same time.

Bader: Right. The company that I have now, we've gone through similar transitions where we have a new package of services. The solutions are bigger. We have to upsell where we go in the organization to do that. Those are big, big changes in any organization. And the fact that Intel identified that that was the direction that it had to go, that it wasn't just a chip company anymore and could turn hundreds of folks into being effective solution-selling people in such a short period of time is, in hindsight is astounding.

House: If you think about it, I think Gordon Moore was CEO at the time; Gordon is the ultimate silicon technologist. Andy, of course, wrote the book on silicon technology. Our technology development group was and still is the backbone of the company. Always was the backbone of the company.

Our wafer fab capabilities, our ability to actually produce this stuff and get decent yields and reasonable quality were what the company was known for. And we came out of the semiconductor industry, many from Fairchild Semiconductor. We were a semiconductor kind of company.

The microprocessor at that time was sort of an oddity. It was Gordon who would say, you've got to have the memory, because otherwise you could never debug the process because you can't test it unless it's a nice x by y array so we can find the defects, and we can study defect density, and the microprocessor is random logic, so you can't really use it for process development. So we were sort of this sideline product.

After Bill had joined the company, well actually Ted Hoff started developing the first SIM boards, the first boards to demonstrate that the 8008 and 4004 and then the 8080 would do things through programming the functionality. That wound up evolving into the development system. Bill really drove that business in the very early days.

With Jim Lally from a marketing standpoint, and Bob Garrow from an engineering standpoint, they built this little oddity (The Development Systems) that was quite profitable. It was bigger than the component business. We also had this memory systems division that was an appendage as well. But we were still a silicon process, chemistry, physics, and technology development, wafer fab kind of company.

That's why I think we were a naturally, selling the microprocessor. We were selling registers. We were selling addressing. We were selling chip size. We were selling I/O buses and we had our head into semiconductor things. That's what we were selling but the Crush campaign just took that and turned it upside down.

McKenna: I remember earlier, earlier years, whenever Mike Markkula was product manager of memory components. That's what his job was. And he was telling me that we've got this new thing, called the 8008 at the time that was going to sell a lot of memory. So the whole idea of the microprocessor originally was it's going to sell a lot of memory.

Katz: And it did. It still does.

House: When I took over microprocessors in '78, the division, got credit for the sale of the memories that went along with a microprocessor. And we came up with specially numbered components. So the memory components organization had the 2104 static RAM. But we had an 8104, which was the same chip, but that was what you used with a microprocessor.

Bader: Part of the kit.

House: And so it was a kit sell. And we had memory. The whole story was, we test those differently. We have different test programs. They're optimized around the microprocessor. You can't use those other parts because they're not optimized around the microprocessor.

Katz: And they have all the second sources.

House: Yeah, they have all the second sources. And so even then, we counted as part of microprocessor business, the memory business that went along with it, because our job, at that point, was to sell memories.

McKenna: Well there was also, and I don't know if we're getting ahead of ourselves but it was this transition because the Japanese had entered into the RAM business, they were driving prices down, and I remember that people were asking Intel not should you be staying in the business, but why are you in the business, because the returns were so bad.

And as a result, the company was transitioning. The microprocessor market had not really taken off yet. The memory business was declining very rapidly. The move toward microprocessors was beginning and we were faced with competition from Motorola and TI on their processors.

House: So the company wasn't that strong at the time, was it?

McKenna: Yeah, it was a very life and death struggle.

Elliot: So let me follow up one item on the specially numbered components. It's my recollection and I'm asking, didn't we get more dollars per unit for the specially marked compounds?

House: Oh yeah, they had a higher price.

Elliot: So they sold at a higher ASP than a standard component.

House: From a memory standpoint, it was really the 4K-DRAM level that we lost that business to Mostek with a 16-pin chip versus our 22-pin 4K-DRAM. And with the 16K-DRAM Mostek was losing it to the Japanese. It was about this point in time when the memory business came under heavy attack.

We certainly were no longer the leaders in the DRAM memory business, but we were, in static RAMs, and in EPROMs. The EPROM business was just getting started. And so those were really a better integrated

for sale with the microprocessor at that point in time. Even the memory business was becoming more reliant on the microprocessor for that reason.

Elliot: Back on Crush as opposed to memories, which were a key, can anybody accurately say what they believe the strategic and tactical objectives we had for Crush were?

Katz: I'll take a shot at that. The strategic objective was to regain our leadership role in the perceived microprocessor marketplace. And save our company in the process by being able to sell all the other products that the flagship microprocessor could drag along with it. I think we actually used the term drag business.

Katz: The tactical thing, which was really quite remarkable, is we put all of our former marketing hats on. We were all engineers, but we'd all had several years of marketing behind us. We had some very creative folks like Lally and Mr. Bader here, who thought what we call sideways, think sideways.

Bader: Lateral thinking.

Katz: Lateral thinking.

Bader: Thank you. That's a nice way to put it.

Katz: I think that was Lally's term in fact. We came up with some really good tactics. The nine programs that I mentioned, I'll tick off a few of them. There was a major campaign to make all new literature that supported this system sell.

Katz: They all looked the same. They all appeared to be the same family.

Bader: The Crush golf ball.

Katz: We had kind of a logo kind of thing too. But we also had a special book (Futures Catalog) of all the future things that are coming out. And that was a prize to be given only to the seminar attendees. And the seminar program and the design win program, I think, were our two most brilliant tactics.

The seminar program had two branches. One, we sent our executives out to do the high level sell to our major customers, high-level executives, along with our engineers to talk to their engineers. And we did one-day seminars that way to poison their minds. And then we also had the second phase of seminars

which was a public, by invitation, to all the rest of the customers two-day seminar sessions at all major market places in the world.

And this went on for like six or eight months, where we took people out of the factory, engineers off their engineering workstations, or desks or drawing boards, or whatever they used in those days and sent them to the field with all their credibility, and talked to the engineers in these seminars. And that was a very powerful thing.

Then finally, the last brilliant tactic was the design win the incentive program, where we had told each of the sales folks, you have this quota of design wins you must achieve. If you want to get to the golden prize at the end, which is a trip to Tahiti for you and your significant other. And if you get to where your quota is, which was roughly a design win per month on average, which was like three times the rate they had been coming in previously, then you have to make sure your district makes it, or else you can't go. And so you help all the folks who didn't get there yet. And that just worked like a charm.

Moreover, we were a little bit devious in the beginning, but about halfway through the contest, we started sending brochures about Tahiti to the significant others, to pressure them to pressure their salesperson. And that worked also very well.

House: Okay, the design win goal. We're trying to figure out how we're going to measure this. This is Intel; you've got to measure it. And I think it was Lally who said, we need 1,000 design wins. It was a number; it was either Bill of Jim. But that number was thrown out. And it seemed like an enormous number. And then as we were developing our plans, somehow that number got changed to 2,000. And that wound up being the number we would take to field sales.

Katz: And we actually achieved something over 2,300. And that's how virtually everybody in the sales force got to go to Tahiti.

Remacle: Was there anybody who didn't get to go?

Katz: A few.

House: I recall there were a few, but not very many. But nobody from the factory got to go. Originally, some of the factory people were going to be able to go on this. But the cost was so high because so many made their number that all the factory guys got canceled.

McKenna: I have in my notes from one of the early meetings in 1979, December, six sort of objectives. One was to this whole idea of moving components to systems. And by the way, Dave, you came up with a whole new naming system and strategy, which was no longer used product numbers. It was changed to a system level identification. Two was to create the idea that the 8086 was the architecture, not just a product, but the architecture of the 80s. Number three was design wins, which Dave just talked about. Number four was to use the top management of Intel. Gordon Moore and Bob Noyce were industry icons. They were bigger than life. And so they really did exude credibility.

Number five was to give a hint of the future. That is, this futures catalog project, which was to show complete solutions and upward compatibility, because we thought that Motorola really had a product strategy versus an architecture strategy that would evolve into the future. Number six was that we saw Europe as a big opportunity.

Remacle: So the upward compatibility of software and positioning the company around a whole product, total product sales strategy was a pretty big change from the way Intel had been operating. How much arm-twisting had to go on?

House: We had a hard rule that we didn't talk about futures till we had time to sell them. And the whole idea that we were going to go out with a 186 and the 286, which were just products in development at that point in time, and we were going to start telling our competitors-- because if you tell the customers, the competitors will know-- what we were doing, the plans relative to peripheral chips, and then the system level plans. And we created this futures catalog that you talked about, that was, you can only get it if you come to the seminar.

Remacle: What was in that catalog?

House: It was pseudo data sheets. 186 and 286 next generation microprocessors, a bunch of other system level products as well, and development system products, that were still under development. It was designed to be like a pseudo data sheet. So it didn't have all the timing specs, and all the details, so you couldn’t design with it, but it was an architectural sell.

Bader: It says, here, a hint of the future.

Katz: But you can only get there if you start with today's products, which was what we were trying to sell, 8086s.

House: Because we were doing too well selling that against today's products the competitors have, so we thought we'd try selling the ones we're going to have next.

McKenna: A little smoke and mirrors.

Bader: This was the time when Intel objectives were always “be and be perceived”, Right? As I remember we were concerned with market perception, about Intel reestablishing its leadership in the microprocessor marketplace.

House: One of the things was that Buckhout had said, we are number three. You know, there's Motorola, there's Zilog, and there's Intel, or another customer may be Zilog, Motorola, and Intel. But we're number three. And one objective was that we would be number one in perception. And that's where the PR campaign, and the advertising as measured by the customer's perception.

Elliot: Ask the customer!

House: Ask the customer, and they would say Intel is first.

McKenna: I remember I had gotten to know the fellow that ran the microelectronics lab at GE, Marshal Kid. He published a newsletter on microprocessors. Do you remember him? He once said to me, I was talking to him on the phone, those little companies that are designing with the 68000 are capturing our imagination.

They were getting a lot of benchmark articles. They were getting a lot of the mind share of the community particularly the journalists that were writing about Motorola as being a leader. We had to do a lot of selling at that level.

Elliot: So this was basically because we all sold the same. We all sold registers. We all sold components.

House: We were all semiconductor companies.

Elliot: We were all semiconductor companies. OK. So this was what convinced us to change from being the same as the competition.

Katz: There were two things that we detected, or wrote down and discussed about during our seed meetings. And that was that Zilog was a relatively little company and couldn't keep up with us in manufacturing, in number of projects they could manage, in full sales force support, and all of the other things that we had advantages on.

The second one was that Motorola, while they were a big enough company to do that, they were too big. They had the inertia of being a big company with many other diverse product lines, and couldn't act as quickly as we could.

Elliot: I believe I also recall that one sales force at Motorola sold everything they manufactured. So selling 68000s, or microprocessors, was a very small part of the salesman's job at Motorola.

Bader: I think the other big piece of all of this was the shift from hardware to software.

House: That was a big item. Before it was the hardware engineer-- we'd been selling into embedded control, and we were selling against sequential state machines designed with MSI logic, and that was a electrical engineer sell. And suddenly with the 8086 the 68000, the guys writing the software were the guys suddenly making the decisions. And we were losing at the software level.

Bader: We had the software crisis. Was that part of Crush, or did that come later?

McKenna: That was part of it. But it was probably in 1980, '81. And it was this whole idea that it was about microprogramming, and that if you really had to essentially hire all of the engineers to do all of the programming in the old way, that you would consume all the engineers in the world.

House: There weren't going to be enough engineers.

Katz: So you needed a high level tool.

Bader: High level tool--

McKenna: Bill and I figured out, we were in a cab in New York City, little story. And we were heading to, I think was Electronics Magazine or Electronics Design, and we had figured out exactly what he was going to say. And he was scribbling off on an envelope, and he came up with this thing, I think called the software crisis. And he had done some calculations literally on the back of an envelope. I think was a Hilton hotel envelope.

And in effect, he presented that at one of these technical magazines. And they just took it completely to heart, and said, yes, you're absolutely right. And that became a major theme, sub-theme, I think of the program.

Remacle: Regis, I'd like to back up and start back to when you became involved. You were like an individual adviser or part of the steering committee. But then you had a team at RMI that was helping execute, because I remember RMI people wandering around the corporate marketing area, working with Larry Kurtzig in particular. Who else from RMI beside yourself was involved at the execution level?

McKenna: Oh boy. You're going to tax my memory.

Katz: Delaney was there, as our ad guy.

McKenna: Bill Delaney and Jack Ramsey were some of the primary people.

Remacle: Was Bruce LeBoss part of the team?

McKenna: Oh no, he was much later. We were pretty small. I mean we started in 1970. And actually were growing at this time, because of Apple quite frankly. Apple had hit 100 million by 1980, and was growing significantly. So we had grown pretty as well. But I know two of the key people were Jack and Bill. We also had an art graphics group. And quite frankly, I don't recall all the names.

Remacle: Speaking of art graphics, can you talk about the decision to use the Nagel art in the campaign? How was that received?

House: Oh, that was revolutionary.

Katz: It was futuristic.

House: It was very futuristic. And it was very much a higher-level message. Instead of advertising chips or development systems, this was much higher level.

McKenna: Yeah, Pat Nagel was an illustrator in Los Angeles and was well known. He essentially illustrated Playboy articles. And had this kind of mauve look, that you might say, very almost art deco look to his advertising, or his illustrations. And the whole idea was to project Intel as a futuristic company. And so while we gave this systems message, we would use very, very unique kinds of illustrations.

Remacle: How hard to sell was that?

Bader: Primarily people, I mean Intel executives!

House: It was old people!

McKenna: Old people, yeah. The ads won all the awards. I mean they really did win lots and lots of the awards. It was hard. It was controversial at Intel. And because it was significantly different than anything we had done before, for component products. Again, this was this kind of shift in that world.

Katz: There was no milliamps or nanoseconds in those ads.

McKenna: Right, none.

Remacle: Who approved them inside Intel?

Bader: Nobody.

Katz: I think you're right. I had to approve them, but I was kind of under the gun. I had to defer to Regis and his guys.

House: Whom were you working with? Who was the head of corporate marketing at the time?

House: Bill?

Bader: Well there was nobody.

House: I think Bill was the guy that wound up approving them, because Lally had systems, I had components. And it wasn't something that went across both product lines.

Remacle: I think Dick Boucher's from the corporate marketing group came out of the Crush program.

McKenna: Yeah he came later. But I know Andy stopped me once in the parking lot, and he told me that it would really save Intel a lot of money if they just fired us. And I asked him what that was all about.

And he said, well, there's so much debate over those ads, all the engineers are standing in the halls arguing over them or talking about them. Some like them. Some don't. That if we got rid of you, then we would get rid of the campaign and people would go back to work. And that's what you wanted. You wanted it to be noticed. You wanted to have this make an impact.

House: I think Ed Gelbach had the sales organization at the time under him, and Ed liked those ads, I remember. He was very influential.

McKenna: Ed also had us come up with an ad at the time that only ran inside Intel, which was “Is Intel ready for software?” Do you remember that?

House: No I don't.

McKenna: Because this was that switch, and it was just an internal, he had it made, I think, just for the noise. He had us come up with it. My primary job was trying to convince most of the media and the analysts. And I remember sitting with an analyst at Morgan Stanley in their cafeteria, and talking about Intel. And they said there's only one systems level company that we're interested in talking to, and that's IBM.

Just to let you know, at the time, it was not until 1983 that the Wall Street Journal would write an article on a company that was not listed on the New York stock exchange. So getting management attention-- there wasn't journalists out here. We had to go back there. And Dave and I did a lot of east coast trips. Bill Davidow and I did a lot. Noyce and I did a lot.

And so it was selling, if you will, but also convincing them by bringing people in like Bill but I can't underestimate the impact Bob Noyce had.

House: Noyce was unbelievable.

McKenna: Unbelievable. He got it right away. He understood it. He projected. in fact, I've come across some articles from that time, interviewers. And boy, it's really phenomenal how perceptive and how much he could project that marketplace.

Remacle: Rich, you were going to say something about the Nagel ads.

Bader: I'm trying to say that they, the Nagel adds, were provocative, was the key, I think, that Regis put his finger on it. You want ads that stir things up and get people talking. And these ads certainly did. There was a twinge of Star Trek-ness to them in the style.

Katz: Well some of characters in the illustration did not have pupils in their eyes. And that really bothered some of our engineers. And in fact, it bothered them so much, that if a later ad was demanded to have a beautiful woman with pupils.

McKenna: And we did, if you remember right. In fact I have that illustration. I have it copied. But I should have brought it.

Bader: The comment I made about nobody approving the ads, there just came a point when the Regis people would be very strongly set about “This is what we need to do”.

Bader: This is what we need to do. And fortunately, they were most often right and we'd run stuff.

Elliot: Regis, it would be very nice if we could get copy of the ads. But I guess I would be more interested in getting copy of the copy that went with the ads, because that was what was really repositioning. The image caught people's attention, but the captions and all that went with those things were what really made it work.

Bader: I just goggled it, and there's nothing to be found on Internet.

McKenna: Yeah, unfortunately, a lot of those ads, if not all of them are unavailable. I know I have one sort of print of one of the illustrations, or maybe two, they are copies of it. But I sold my advertising business to Jay Chiat in 1981, and everything went to him, all history, artwork, and so forth.

And it was, by the way, Jay Chiat who I believe led us to Pat Nagel in the first place. He was a close friend of mine. We stayed in touch even though I had an ad agency. I had showed him all the work that we were doing.

And he was probably the sort of the leading edge agency, still doing Apple's work today. In the business, even at that time, he was my agency when I was at National in 1967. So that's where it all went. I've tried to track it down, but not recently.

Elliot: One interesting comment that I'd like to hear or have you guys comment on is “Intel's perception of Crush today”. I recently made a request of Intel through their museum for any and all materials on Crush, for this effort that we're putting our time into today. And the first thing that happened as a result of that is the line went dead. And I thought the person on the other end had hung up on me.

When I finally asked was she still there, she responded, and saying yes, she was still there, she told me the following. Crush is still generally a topic that was not discussed at Intel. She knows little about Crush. She knew the name but indicated that she felt lack of knowledge about Crush was common throughout the company.

House: Well it was a very long time ago.

Katz: Well not only that. It became, as we discussed earlier, a legal “stay away from topic” issue.

House: Intel went through the whole antitrust. I mean, they've had a lot of history of dealing with antitrust. So I'm sure that discussing the Crush campaign was discouraged. Wearing that t-shirt would have been unacceptable The government probably would have liked to have your t-shirt as evidence,.

Bader: It's just a t-shirt. We were just kidding around.

Remacle: It wasn't a corporate statement.

Elliot: Well there was a Crush 2 campaign that followed that.

House: There was. It wasn't near as--

McKenna: Energetic.

House: Energetic, yeah.

Bader: There was a Woodstock 2, also, and it didn't do as well either. But I think that there was edginess to the campaign, a subversive nature that was part of it that I found attractive. This was not your typical corporate campaign. This had an edge to it. And part of it was traveling under the legal radar to make all of this stuff go, that I think added a level of excitement and commitment to the whole process.

McKenna: But the transition from components to Systems Company is still a legacy. I think that, whether people recognize it or not, that's really what Intel is today. This was a transition from that whole component the world. If you look at the component companies today, National Semiconductor was bigger than Intel. It was started before them. There are companies that are still in the component business that have never achieved the kind of position and recognition. It all, I think, is due to that transition from components to systems and what that all meant.

Remacle: Was the Intel delivers and this shift Intel delivers solutions a direct have a direct connection to Crush?

House: I can tell you a little bit about that. When I arrived at Intel in February '74, Intel delivers was to differentiate the fact that Intel had a policy of shipping orders in the order that they came in, where our competitors, at the end of the quarter, would ship to all the high ASP orders. And so the salesman would say, if you really want to get this, you need to give me more money. And so, in the business, you never knew whether you were going to get your product or not.

I know Gelbach was very strong in that customers have to depend on us. And the Intel delivers logo, or byline, which was printed on everything in those days, was really a response to our competitors shipping at the end of the quarter to the high ASP orders. And then Intel delivers solutions became the byline. And then as we started moving towards ingredient branding, it was “Intel-Delivers”, “Intel-Delivers Solutions” and “Intel-The Computer Inside”, that in many ways, were the precursors to Intel inside.

McKenna: Initially it was because at Fairchild where many of these people had all come from was constantly introducing new products, but so many of them were smoke and mirrors. And that was, in the early days, one of the companies they were positioning against.

House: And that's why we had a policy of not announcing a product until we could deliver.

Remacle: But to ask my question again, was the delivers, the enhancement of delivers to delivers solutions, did that come as a direct response to Crush, or part of Crush? Or was that just part of some other evolutionary effort?

Katz: I believe it was part of Crush. As we came up, or Regis's folks came up with this geodesic dome logo, which had all the pieces of the system. And then we called that the solution. And so we just took the old-fashioned Intel delivers and put solutions next to it, as part of Crush.

McKenna: I think it was part of it, yeah.

Elliot: Now**,** I'd like to do now is move to some of the execution. And the most obvious big execution efforts were the seminars. The one-day seminars, as Jeff has mentioned I don't recall them all as being one day seminars for major accounts. And the two-day general seminars, I do recall in very much detail.

Katz: That's because we had you on the road doing the two day seminars while we sent the executives out for the one day efforts.

Elliot: Well, one interesting thing was a two-day seminar at IBM La Gaude with Bob Greene.

Katz: I suspect that the overseas template may have been slightly different than the US one.

Elliot: So anyway, I've made a list of the places where I know seminars were held. London, Stockholm, Milan, Tokyo, Los Angeles, Dallas, New York, and the La Gaude, France, that I was in. Can anybody remember other locations that we had seminars?

Katz: There were about between 25 and 35 total, worldwide. Major marketplaces, Minneapolis was another one and two or three times in Boston area.

House: Any place where we thought somebody might be designing with a microprocessor.

McKenna: Well there was a matrix.

House: Right, there was.

McKenna: I think I have that somewhere, by industry.

Katz: So we had the industry matrix. We had the location matrix. We had the great big map, eight feet wide, where we'd put pushpins in wherever we went. One color was seminars; another color was actual design wins. And we managed a war room to keep track of all of the activity.

Elliot: I remember the war room. Nobody took a picture of the war room though.

Katz: We dedicated one whole cubicle to it. It had literature stock. It had the map. It had the schedule a timeline of who's going where, when.

McKenna: But there was a matrix that had it by industry. And it was the computer industry, the telecommunications industry, industrial, and so forth.

Elliot: Military industrial.

McKenna: It had the top 10 companies in each of those categories. And those became targeted companies; I think, on the design win. Somewhere I have that, I think.

Remacle: What was the role of the regional sales managers in this?

Katz: They were just kind of cheerleaders.

House: Well they all had quotas that were trying to get their people to hit, so they could go to Tahiti.

Katz: But they didn't personally didn't get the design wins. It was the sales folks and the FAEs who did.

Remacle: I understand that. But what were they, liaison with the factory? What else were they doing relative to the seminar efforts themselves, and add to not only the sales management, but also the FAEs.

Elliot: Sales Managers, Regional and District had the task of coordinating sales efforts, allocating FAE's and dealing with distributors to set up and manage seminars, no small task. In addition, they were responsible for making sure that all sales staff made their number so the district qualified for the trip to Tahiti. I'd like to mention the cooperation among our sales staff on this. Quotas were not equal in terms of the potential design wins from customers each was responsible for. Sales who had more that they needed contributed efforts to those who needed more that they could deliver on their own. There was a real camaraderie that developed so everyone succeeded and the company won big as a result.

House: The FAEs were central. The FAEs had to go in and do the pitch directly to the customer; they're the one that were the design-win sales force. They were responsible for helping the customer do the design, sometimes in spite of the customer's own engineering prowess.

Remacle: Can you talk about Intel's FAE force, compared to Motorola's and Zilog's?

House: We had a significantly larger FAE organization; we were the first people to come up with it. I remember late in '73 or early '74, I had accepted the job at Intel and hadn't started. And I went to Ed Gelbach's regional manager meeting. The big discussion about, do we hire field application engineers? And we decided to do it at that meeting. And then we immediately started adding field application engineers.

The idea was you go into the customer base and find people who had designed with microprocessors and hire them. In fact, you wanted to hire the people who had designed with the competitor's microprocessor, because we didn't want to take people who had designed with our microprocessor out. We wanted them to continue to design. And if we could hire the people that designed with a competitive microprocessor, we kind of had a double whammy there. But they had to be engineers who had designed stuff. And they were FAEs they didn't have a sales quota. Their job was simply help the customer.

McKenna: They didn't do pricing, and they didn't sell. Gelbach got that from Don Valentine. Valentine previously initiated FAEs at National Semiconductor.

House: No kidding.

McKenna: Valentine hired people out of their customer base. They were not assigned any quotas, but their job was to get design wins.

Katz: There was also a second program, roughly at the same time as Crush, where instead of hiring experienced designers from the customer base, we were hiring new grads in computer science and in double E, and in marketing and finance. And we called them technical sales engineers, TSEs. They were very instrumental in the Crush program too, because the combination of the TSE and the FAE became the follow up team.

After we did a seminar, either at a major account or a public seminar, it was their business cards that we handed out. And all the customers that had questions to be asked had to get through that sales office, and then they'd of course have their assigned field sales engineer.

McKenna: Incidentally, I think that's another real critical thing, because when you're talking about sort of--you expect the regional sales people to do this feedback. But I think one of things that Intel learned from FAEs and was expresses by Buckhout and his memo was that the field application engineers were working directly with the design teams at customers, and that feedback was directly into the engineering at Intel.

So there was this closed loop thing that was a kind of trusted relationship. They knew each other's business. They knew each other, how to adapt and solve problems.

Katz: So not as part of Crush, but at the same time, and previous to it, and after it, there were regular field application engineer conferences in the factory, where we would expose new products and teach them about them. Also there would be major sessions in there about, what are you hearing from your customers?

House: The FAEs would also critique our products, what was wrong with the products that were out there, and what was wrong the products we had in development. They were an important part of the product definition process.

Elliot: FAEs had the most direct insight into customer's requirements and actually proposed new products they perceived their customers needed or wanted. In some cases, we teamed an FAE with a Product Manager to come up with a new product proposal.

Bader: They helped the board group, too. I mean, we changed product line directions because we got input from the field.

McKenna: I believe it.

Elliot: If my memory serves me correctly, most if not all of our FAEs at that time were generalists, but they were focused on designing microprocessor systems, not designing memory systems.

House: They were all microprocessor design engineers.

Elliot: The first FAE, by the way was hired by Bill O'Brien, regional manager in the Los Angeles area. And unfortunately I don't remember his name. But that was the first hire we had. At some point, I'm just trying to establish timelines here; we started adding FAE specialists to our microprocessor organization-- and our FAE organization.

Katz: Software folks I think.

Elliot: Software focus, architecture focus, et cetera. Was that during or part of Crush, or did that happen at some subsequent time?

Katz: I think it came a little later at the 286 level, when the software became quite complex, and we needed real software engineers, not double Es, to help the customers.

House: I remember you, talking about the technical sales engineers, and also Gelbach saying, we're going to go out and we're going to find those B and C grade-engineering students who were active in athletics or they were in fraternities and they had a personality. We're not going to try to hire the A students. We're going to hire the guys who had all these extracurricular activities going on.

Remacle: They understood building relationships.

House: That's right.

Elliot: So one of the things that I recall, and would kind of like your opinion on, is I remember having field application engineers do part of our two day seminars.

Katz: Yes.

Elliot: So there must have been a training session or something, because we were actually going out in two-man teams part of that time.

House: Part of the theory there was to expose them to the customer and give them credibility with the customer. Also, to get them trained. There's better no way to learn something than teaching it. Getting them to the position where they could handle the material on their own was a key to success.

Remacle: How did you manage quality control to make sure that the messages stayed on target, because one my experiences working with field sales organizations is they kind of like to customize things.

Katz: Every one of the seminars had a factory team, as I said, with factory engineers and marketing management.

House: There was a standard set of 35mm slides. And there was a notebook that went along with it that you delivered. So if you got those slides to work with.

Remacle: This was before PowerPoint.

House: I remember carrying around those boxes of slides.

Bader: Some people did. Some people had foils.

Elliot: Really?

Bader: Absolutely. I remember the session in Milan, which was-- I'm back there now. And it was-- it looked like the UN Security Council built facility. This huge enormous table where the audience was seated like they were in a boardroom. We were way up on this raised stage, with this giant screen behind us, looking back, it's a two story building, looking up at the glassed in place where the translators were feverishly trying to translate what we were saying into Italian. And some poor guy from the field office, sitting on the floor, flipping foils, all day long. Flipping foils.

House: I remember we would meet with the translators before and go over some of the material so that they would know how to say the technical terms.

Bader: That's a good idea. I don't think we did that.

House: I remember doing that.

McKenna: Jeff, I think in the war room, you had this box. I think it was wood.

House: No, no. That was the Klingon Neutralization Kit.

Katz: That was the previous year's marketing campaign

Bader: The Klingon box, yeah.

House: That was the predecessor to Crush, which was 8085, focused; we would go after the enemy who were the Klingons and other enemies from Star Trek.

House: And that was a Klingon neutralization kit. And so we had this idea that factory--

McKenna: But it was a pitch on everything.

Katz: They were literally ammunition boxes. The contents were the weapons and ammunition.

House: The whole idea was that the salesman could go through and put together his presentation. So there were like 25 copies of every slide, article or datasheet.

Katz: We sent one to every field office.

House: And the field office thought that was the most ridiculous thing that ever happened, because they had copy machines. Why do we have this big wooden box in our office? But it made a big impact. It was sort of the precursor to Crush.

Bader: I remember a one quality control event. As we were saying, we brought a bunch of folks from the factories. Many of them were engineers that hadn't done presentations. And I'm telling you; this place in Milan was just a daunting presentation place. And one of the presenters, for the first time, got up and he froze. He just froze. And it was a couple or three very awkward minutes. And we finally escorted from the podium. And we had a backup guy who stepped up and did the slides. I guess that was a great proving ground for everyone.

Katz: I remember two events in that seminar series that still stick with me. One was my learning how to pace myself in a foreign language with translators, because our two-day seminar filled up two days in the US. But when you have to talk for four sentences and wait for somebody in Japanese to say what you just said in 10 sentences, you couldn't get all the stuff in. So you had to decide while he or she is talking, what am I going to say next for four more sentences.

McKenna: What's the most important, particularly in Japan?

Katz: --to get it all in in two days. So that was one new lesson I learned. The other one was travel was kind of brutal. We'd do four sessions a week, four different companies-- four different cities-- but they are two-day sessions. So I'd do day one, and then go to the next city for day one. And somebody else is doing day two at the first city. And so every night you have dinner with the local team. You get on a plane at 8 or 9 o'clock at night. You show up at close to midnight.

And I got a cold on the way on one of those weeks. And I woke up the next morning having almost lost my voice the day before, with zero voice. And I didn't have a backup at that point for day one. And so I took the microphone like this, and I stuck it down my throat practically and whispered the whole seminar, until about noon when Bob Greene was snatched away from his day two session and came to finished my one day for me.

Bader: And that's where I met John Beaston during the Crush campaign. I get Multibus II and Crush confused but I know we were in Eindhoven. I know Bill Maxi was there. We'll see him tonight. I remember we did London but I get that confused with Bill and Don Phillips.

I remember Bill Maxi finishing the seminar and then starting his sabbatical. And going to see the running of the bulls, and we ended up in Venice together, just coincidentally. But that's another story. So I remember Brussels. I remember London, Eindhoven, Paris and Milan. I think that's it. At least those are the ones I remember.

House: We had to go to Ivrea because that's where Olivetti was headquartered. That was in many ways, a precursor to Crush. Olivetti was about ready to make a decision. I remember going there. I remember calling Tom Lawrence when he ran Intel in Europe, and he was in Bali on vacation, and saying, Tom, you

got to come home. We got an important appointment in Ivrea. You've got to come. Olivetti was about ready to make a decision on a microprocessor. And we parachuted in. I was there and made the pitch. I think it was pre-Crush, because it was more of a component and a component futures pitch. But it was the first time I remember ever sort of opening the kimono so to say.

Katz: That might have been a prototype for the future pitch.

House: And talking to them about what we had coming next.

Elliot: It was a prototype for the futures. It was also where we got one really important message that we didn't have initially. And that was the systems concepts were really reinforced by Olivetti. I have seen a number of notes that indicated that they liked what they saw, but they didn't see how it related to systems solutions and we got that. I remember going back to the hotel and realizing that we had made a breakthrough, done something important, trying to think through the inputs from the meeting and how to put them into our strategies and tactics.

McKenna: I think that's where into the future came from too, was that presentation.

House: I remember going and staying in the typewriter hotel. Remember, they had a hotel that looked like a typewriter. Olivetti was famous for typewriters. They had a hotel that looked like a typewriter, every room was a key and every room had a balcony. When you went inside the room, it looked like you were in a ship, a ship cabin. It was all done with wood, very modern.

I recall going to Olivetti being very formal with a tie on, and it being very hot, humid room, perspiring, and waiting for the Olivetti executives to come out, and making this pitch in a very formal sort of setting about the future.

Remacle: You've talked several times, all of you, about the executive-to-executive presentations and that was a shift in the industry, certainly. How did those presentations received by customers?

House: Well first thing was a question, “Why do we need to talk to a semiconductor company?” When you go, and you want to talk with the VP of engineering or the CEO of a computer company or systems company, that had always been delegated to the components guys, which were basically the purchasing department. And the problem was always why should I as a senior executive talk to these people?

Davidow had made the point that choosing a microprocessor architecture as the most important decision you're going to make for the '80s. We have the architecture for the '80s. This is the most important

decision you're going to make. It's a decade long decision. This is not a decision you should delegate to your people. This is a company changing decision. And that's why you need to talk to us.

McKenna: There were just critical economic issues that I think were more conveyed executive to executive they were more credible on that level. It was the economics of time to market, of being able to essentially prototype and turn around into a production very, very quickly. Flexibility.

There was a lot of key benefits that came out of, I think, the program that you all had put together, that the executive management level at least began to question, are we on the right path? And I think that was really why that program was put into place.

House: And we would send an executive from our company simply because we wanted them to feel like since we were sending a member of the executive staff, they had to have somebody of equal status there. And so we sent people who had nothing to do with microprocessor, nothing to do with Crush. They just had the right business card.

Elliot: Well I remember doing this with Bob Noyce.

House: Well Bob could get an audience with it anybody.

McKenna: He didn't need Crush to do that.

Elliot: I remember specifically going in with him during that time to Tandy, Radio Shack in Fort Worth TX.

Elliot: And flying in there. And of course, he flew in I think it was in the Rockwell at the time. Anne was working for Apple by then, so she came along because Apple had facilities there. But we ended up with the executive staff from Tandy in their executive dining room, on their executive china, with their entire staff, and being served by about 12 young ladies dressed in French maid costumes. This was the Texas, Tandy approach at the time. But you're right. Bob could get an audience with anybody.

House: Their executive quarters were pretty nice.

McKenna: The name of the guy, though that actually put them in the PC business.

Bader: Isn't it John Roach?

McKenna: Yeah, I think you're right. I think it was.

Katz: The product was the TRS80 and the Tandy engineer was Steve Leininger.

Elliot: Intel had discussions with Tandy's Steve Leininger about designing the TRS80 using the 8080 or 8085 but the final choice was the Zilog Z80, one of our significant losses.

House: John Roach became CEO of Tandy based on the success of the TRS80.

Elliot: That's exactly who we were competing with, Zilog (Z80) and Motorola (6800).

Remacle: Jeff, can you talk a little bit about the godfather, as it got to be more formally known.

Katz: As part of the executive-to-executive seminar program, there was a follow up system, where the executive assigned to any given major account, and they were, as somebody has just mentioned, all from over Intel. They weren't just microprocessor executives. I traveled with Craig Barrett who at the time was the QA guy.

Anyway, each executive that went out to visit with a major account he was assigned. He was the account godfather. And whenever the sales force needed any help with that account, they could call their godfather, who would remove any roadblocks in the factory to make sure that sales guy or girl got exactly what was needed. They formed tight relationships, the godfather and his or her counterpart in the major account group became close, which was very useful to us.

House: And the godfather was supposed to visit the customer on a certain frequency.

Katz: Visit or at least call on a monthly or quarterly basis.

Remacle: They had it in their MBOs I believe.

Katz: Twice a year.

House: Twice a year was it? And call them monthly or something.

Katz: Which was a very effective thing, to keep reinforcing that major decision from the top.

House: This is a company decision. This is not a programmer decision, or an engineer decision. This is a corporate decision you're making.

Elliot: Rich, you were talking about Milan and London. Do you recall the fact that when we did Milan seminar, we had a London seminar the following morning? They weren't staggered like Jeff was talking about, where you did day one here and then moved on. That particular week was two days in Milan, two days in London. But Al Alitalia the Italian Airline went on strike on Tuesday night.

Bader: Oh, I don't remember that.

Elliot: And we couldn't get most of the team from Milan to London. But we had had the foresight to take all the 35-millimeter slides for day one, which we'd, finished, and ship them with our FAE ahead. The FAE and the sales staff in the UK kept those guys engaged until 11 o'clock, when we finally showed up.

Remacle: When did you begin to get a sense that Crush was working? Did design wins just start to mount up, or?

Katz: I'll take that one, because we had the war room there. And the pushpins started filling out the map. And we knew that we were going to achieve our objectives, certainly our first 1,000 design wins target, and we'd be pretty close to get the 2,000.

Remacle: How early on was that?

Katz: By about mid summer. By the October, November time frame they were just rolling in, because everybody was trying to scramble to get their ticket to Tahiti.

McKenna: But I think what Bill Davidow said that it was the most intense marketing campaign ever conducted by a technical company. And I think that intensity normally would be spread out over probably years in a lot of other companies. But this was really a six-month effort. And then from the weekly meetings, you got updates all the time. So at least as I go through my notes, I see regular meetings in which you get updates.

House: And only Intel could have done that. The microprocessor was too small a part of and not as business critical at National. Zilog was too small and they were spread very thin trying to keep up with Intel. Motorola was too big. It had these large markets, the telephone business, and the telephone equipment switching business, and in that day the radio business. Handheld two-way radios were a really

big part. And then they had semiconductors who were really a division that was created to support the phones and the switches. The outside microprocessor business was only a part of their charter.

To repeat the story, several years ago, I was part of the Computer History Museum's video history series. We organized the 68020 team for an Oral History. We reassembled that team that designed that product. I played the role that Dane and Rosemary are playing in terms of interviewing the people. And we got together before and talked about it. And I couldn't get them to talk about the 68020 because they wanted to hear about the Crush campaign. They told about the frustration they had when they realized, that we were starting this big marketing campaign. They knew the word Crush, by the way. So they felt like they had to do something.

They went to the head of the semiconductor division. And he had to go to corporate marketing and corporate sales, so went to the corporate advertising, marketing people, and said we need a campaign to support this big microprocessor push. And they said, well, let's prioritize that along with our commitments, first we're running this campaign for this division, then this one. And we think we can get to you later the year or early next year. Then he went to the sales force, and of course, they were selling the whole line. They said, well, we've got these programs we're running now. And maybe we can put some resources together. They were just too big. They said a frustration that they had was they were a bunch of design engineers with hardly any marketing.

The Semiconductor Division and the 68020 design team was trying to do what we were doing as a corporation but they didn't have the sales force behind them. They didn't have the corporate marketing. They didn’t have the FAEs. They didn't have the corporate advertising behind them and it was futile. They said they knew we had a better architecture. But we just couldn't compete with this campaign. They couldn't mobilize Motorola.

McKenna: Al Stein who was the GM at Motorola at the time, later on he came to Silicon Valley. I think he was president of VLSI Technology

McKenna: He told me that after I told him the time frame that Crush took place and how Intel pulled together the whole company within a few weeks that it would have taken him that long to get a ticket to go to corporate to even present the notion to his top management. These companies just moved slowly, for a lot of various reasons.

I also knew Gary Boone, who invented the microprocessor at TI, some say before Ted Hoff actually came up with his. In fact, I think there was a patent dispute.

McKenna: He told me that when he first took the idea of a computer on a chip to his top management, he was told, young man, don't you know computers are getting bigger, not smaller? So there was a whole

different mindset that was going on, I think, in the competitive marketplace. Intel management was very, very progressive and very willing to change.

Remacle: This is probably a good place for me to jump in and to repeat something that Bill said to me as he was leaving. He said, I'm sitting here listening to all of this, and I still can't believe we did it. I don't know of another group of people in another company that could have pulled it off.

House: And I think an important thing to comment on. Although I don't know that there was ever a direct link between the Crush campaign and the IBM PC design win, which was the defining design that made Intel the king of microprocessors for all time. But that product was introduced some time in early '81.

We remember the telex came in early in December, and the whole internal campaign was put together in December. And right after Christmas, New Year's, it was launched at the corporate level with our big session that we had all the corporate people.

Then after that, there were a series of things during 1980 that we were doing, including all the different presentations, advertising, futures catalog and so on that we were focused on. It was during that time, and this is another topic for another time, another video history but it was in that time that we were starting to hear about some activity in Boca Raton. That wound up, only a year after we launched the Crush campaign when IBM announced the IBM PC.

So the impact that might have had, I think we could speculate on. We don't know. But clearly, you're asking about the momentum in the summer we started seeing these design wins all of a sudden start piling up.

Katz: We didn't see IBM at that time.

House: We did not see IBM. We did not see IBM. But the enthusiasm grew as we had the success in the second half of the year. And then we were hearing, as Dane knows, about the activities in Boca about the same time. So it wasn't, I don't know that it was ever a pin on the map.

McKenna: Well because, I think it took IBM a while to decide that they were going to outsource the processor and the software because they made everything themselves.

House: That's another discussion but, that design, from the beginning, was using Intel.

Elliot: Boca Raton was specifically set up to deal with outside semiconductor companies.

McKenna: But before Boca Raton, whenever they were looking at the initial-- and the decision at that time was-- now this is from Jack Keeler who was president at the time that IBM didn't go into a market that wasn't at least $100 million. And Apple had hit that point in 1980. And so that really went over the edge. It was time, then, at IBM, where they had to really do something fast, and that's when they set up Boca Raton.

House: But we'll cover that in another time. But there is some interesting timing relative to the--

Bader: You were talking about design wins and momentum. I have a story to share. Most of the big design wins were the component wins. But there were some at the board level. And there were a few districts down in Philadelphia-- Buckhout's region in New York, up in Seattle, Chicago, and Conrad Wiederhold. Those were hot spots for system level activity. And in Philadelphia there was Leeds and Northrup. Pete Delvecchio was the DM. This was one of their big morale wins that they needed to get and it was about a board level product. But they needed parity memory. We didn't have parity memory on our board. So we figured out how to create an add-on board in a very short period of time. That saved the deal. And it was one of those design wins.

In early April, we were doing the equivalent of the business unit update meetings at the time. Everybody in the systems business that was in Oregon was in the cafeteria. I don't know, a couple of 300 folks and I got to tell the story about this design win, and what happened, and the thing, and why it's important, and engineering and the board. And it was great. Tom Kinnon sitting there, was my boss at the time, I think. Bob Brannon's in the audience. He was marketing manager at the time.

I said, I just want to tell you I had so much fun working with these Leeds and Northrop guys that I'm announcing my resignation from Intel. And jaws dropped. And I said, I just have one more slide to say in appreciation for all this. And the last slide that I put up showed a joker from a deck of cards, and up above it, it said April fool's. And it was, in fact, April Fool's Day.

Remacle: Jeff, what was the feedback from the field? When did you get a sense that the field had bought Crush, was pumped about it?

Katz: They were immediately pumped, because as soon as we did the factory kick off meeting in early January, we immediately sent teams to the field offices worldwide. And told them about what was going on. And they were preceded each of those meetings in the field with a video from Andy Grove telling the field how important it was. And that they would all get something out of it if they got a lot of design wins.

And then we went and told them about the nine programs, and told them about the products, and the glimpse of the future they could now sell that they never were able to before. There were so many things

that the field loved to hear, they were instantly jazzed. And they started doing their thing, looking for design wins, by February. Probably March at the latest.

Elliot: As a follow on to that, when do you think the field though they had really turned the corner and were winning designs?

Katz: Midsummer-ish, or maybe early fall.

House: But they were jazzed. They had more confidence than we did, I think, in the beginning.

Elliot: Now, we were not only an X86 or 8086 product line, and a board product line that we were selling tools and support.

House: Development systems product.

Elliot: We're selling the entire systems product that went along with our X86 and earlier microprocessors. Nobody's mentioned anything about the single chip processors, the 8048, 49, 8051.

House: Well that was an important part of it. Selling into the embedded design was a critical part of this. And the development system obviously played a role there. We had development system tools for all of those products. The microcontrollers didn't use as much memory and the software products were probably a little less sophisticated but they played a definite role.

And we didn't really differentiate as highly at that point in time. Later, that group was split off from the microprocessor operation and Intel moved the Microcontroller Division moved to Chandler AZ.

Katz: We had high integration and high performance.

House: Yes, moved down to Chandler south of Phoenix. The business became more differentiated at that time. But in these days, I don't remember if we had begun the process.

Elliot: The move began in 1979 to a site in Phoenix proper while facilities in Chandler were under construction. The Chandler Fab began operation in 1980. The Micro-Controller Operation or Division moved to Chandler from the temporary facilities in late 1980.

Katz: Micro-Controllers were just part of the total solution. If you wanted to just do logic replacement, you used a single chip. If you had to do something that was in system programmable or reprogrammable with a new flavor every time you powered it up, or potentially a new flavor, then you used the real microprocessor, with the wider, bigger address space and more capable software suite.

Elliot: Although, these single chip devices came with the EPROM memories, so that there was a potential of modifying code and updating things.

Katz: That was **the** 8748, 8749 and 8751.

Katz: Those were not for real time re-programmability but for periodic updates.

McKenna: These were Micro-Controllers. Incidentally, just a little story. I'm a diabetic. I've been diabetic for 55 years. And I use an insulin pump.

During those days I read about the insulin pump, which was physically much larger then. It was invented by a guy named Dean Kamen, the Segway inventor. I called him because I wanted to find out what processor he used in this. He used the microcontroller. He started describing it on the phone for, I don't know, two hours, how he designed it. So Micro-Controllers really go back a long way.

Katz: Was it an Intel one though?

McKenna: I think it was, yeah. I don't think I have my notes on that, but I remember the conversation well.

Bader: Look that thing up. Come on. Where's your curiosity?

McKenna: That was then, not now. Anyway, so that's how I met Dean Kamen.

Elliot: Well I remember the other portion of the IBM design was the keyboard controller. And that was an 8048 design. I think we had a specific number for it, 8042?.

Katz: And that was logic replacement.

Elliot: Yes that was logic replacement. But I remember something else about that, particularly when we had competition from AMD because every keyboard that was shipped had an 8042, Intel keyboard controller in it.

House: I think that's an 8041. The 8042 had more memory.

Elliot: But that was a ROM programmed device. So we knew exactly how many PCs were being shipped. Whether it had an Intel or AMD processor, we could tell what our percentage was, which was pretty high.

Remacle: So what kind of reception -- you've told the Motorola story—did Crush receive? Regis, maybe you're a good person to ask this question of, because you were on the call or meetings with analysts and reporters. What was the external, rest of the world of industry watchers' response to Crush? Did they even notice it? What did they have to say?

McKenna: I think that, not so much the analysts early on, but more the media, particularly the technical media, were rooting more for Intel than Motorola. Motorola was not really a marketing company. I think one of the things that that I would really say about Intel is the fact that Intel was on the first to really emphasizing marketing, which they began in earnest with Crush. I think other than just sort of being an adjunct to selling, Intel began with, “HEY”, we really have to market this product.

I think that particularly having me and Dave House, Bill Davidow, and others actually spending time in New York with, the journalists and analysts, made a huge difference. I remember the editor of Business Week saying to me, none of these guys from TI and Motorola ever visit us. We've got to go see them. And we (Intel) went to see them.

Sitting across the table, talking to people, explaining it to them, very early on they really started to get them on the bandwagon. We ended up with a lot of covers. We ended up with an awful lot of attention. We got all of our articles placed that we wanted placed. We got a huge amount of media in that first six months.

Remacle: Dave, who were you working for on ESM at the time?

House: Let me see. So in '78 or '76 it was Bill Davidow. It would have been Les Vadasz.

Remacle: So did he shower you with praise for Crush being such a success?

House: I don't remember Les ever showering me with praise.

Bader: Anybody. That thought came to everyone's mind.

Katz: I think Carson came in there about then too.

House: Carson came in in '81. I worked for Jack-- I'll remember this very explicitly, from January of '81 to January of '83. And in January of '83, Grove became my supervisor. So it was Vadasz at that point in time.

Remacle: Right. My first year and half at Intel I reported to Les Vadasz. That's part of my question, or reason for asking. But was there any praise that filtered down to you guys, that you're doing a good job?

Katz: Not at first but then, interestingly enough, after the Crush program ended and the money was all spent, there was still no revenue. Then we had a lot of development system revenue during the Crush program, and some board revenue was coming in all along, but the chips were still under development at the customer base.

And so at my quarterly reviews with executive staff, they kept saying, where's all of the money from these design wins? And this went on till well into the '80s, until the IBM PC clones started coming into the market in '83 or '84.

Remacle: So there wasn't dancing in the halls.

Katz: No, well we knew we did well. We knew we had all these design wins. But and here's another side note, one of the seminars was in London, and I was there. It was the opening month or so of the musical Annie, in London, which I managed to get to see it. I kept wanting to go back and tell Andy Grove that "The Sun Will Come Out Tomorrow."

McKenna: Moore's law does come into play. Volumes count in this business. Despite the fact that we moved into the systems business, volumes of the chips really do matter. And I was looking at some of the old literature here. And in 1983 to '84, Intel had five consecutive quarters of losses. And so the memory systems, the RAM business had declined, largely due to foreign competition and pricing.

The microprocessor business-- all those design wins, hadn't reached volume production yet. There was this period in which, quite frankly, the IBM business became really, really critical, because IBM then invested to the tune of $250 million in Intel and that really did dig them out of a hole.

Intel, quite frankly, didn't want to take the money. I remember Bob Noyce being really upset over it. They thought perhaps this meant the eventual decline of Intel possibly becoming a part of IBM. But that didn't take place. IBM several years later then sold the stock, and it went back to a wholly owned again.

Elliot: Actually sold the stock and made a huge amount of money.

McKenna: Made a huge amount of money. But at the time, it was a critical investment. It helped ramp up manufacturing in order to be prepared for the volumes that were to follow with the IBM business and the clones.

Elliot: Rich, you mentioned earlier that in spite of the fact that Jeff was not doing well in the early days of the X86, your system level business, your board business was doing pretty well.

House: Shorter design cycle.

Bader: Pieces of it. I mean, systems group was always the unfulfilled promise, unfulfilled potential, of the business. And we'd oscillate back and forth between “we're there to make money as a standalone business” no, “you're really there to be in strategic support of the component side of the business.” Even the charter would vacillate annually. I guess depending upon how much the rest of the company was suffering.

But within that business, the 16-bit boards were, I think, the most successful product line to date, built on Multibus. We had a range of products. Designing with the 16-bit components was more challenging. The chips were faster. The boards were denser. There was more capability packed onto it. So it was harder to get started.

And having the board products there was, I think, a great stepping-stone that helped reduce time to market. As long as those design cycles were, it did help reduce customer design time. There were a number of companies that went into production with the boards. They'll get around to redesigning an optimal product later on, which they rarely did.

I do think that, we started using our RMX86, which is another whole story, which provided some level of software foundation; software became one of the key components of a solutions business. Having a real-time operating system was an important part of all of that. I do think that Systems Group, in that way, did help lead some of them messaging around the solution stuff, because that's what our business was. And only some of the revenue that reflected it.

Katz: It was also a great example of how to make the things work if you hadn't done it yet.

House: Buy a board and copy of it.

Elliot: Well I think we actually offered the schematic diagrams of it so people could do that.

Bader: We offered everything. And for people that had bought enough, we'd give them all of the manufacturing documentation. So if you think you're going to get locked in, and you want to build these boards yourself, we'll give you all of that. So that make versus buy decision was a big piece of the selling process. I don't think anybody ever took us up on actually making the boards themselves.

Katz: They liked that as a back up though.

Bader: Absolutely. It gave you that degree of comfort that you weren't going to get locked in.

Elliot: Did you see an upturn in your business during this period that was a result directly of the Crush effort? Or was that also translated to later like the component side was?

Bader: Well there were some of these highly visible design wins, like the Leeds and Northrup one and a few others, where I can directly point to business that came out of it. But the PC business didn't have a positive effect on the Multibus business, because in a lot of cases, what were the design engineers doing? They were taking our boards, and they were wrapping them in sheet metal, and putting a power supply with them, and they wanted this other stuff, and they needed monitors, and all that, well, gee, that sounds like a PC.

So the entry point then for playing around with X86 architecture then became the PCs as opposed to the single board computers. Single board computers were more evolved in embedded applications. But once the PC took off, that world of reprogrammable systems really took off. And the Multibus business didn't participate as much in that. It was really more about embedded systems.

House: The development system business was also heavily impacted by the PC, and eventually eliminated.

Remacle: Jeff, we haven't at all mentioned the distribution channel, which must have played some role in the Crush program.

Katz: The main purpose of the distribution channel was to organize and establish the logistics for the seminar series. The sales offices had the prime responsibility, but they depended heavily on the local distributors to get the customers to show up.

Remacle: So they were essentially Intel's partners here.

Katz: Yes.

Elliot: There are two other things that have been mentioned but not really gone into here. One is how important the software tools that we had on our development systems were towards making this program really go. The second was, we had this in circuit emulation capability, which nobody else in the industry ever had. And what effect did it have on these efforts?

House: I think that was huge. I think the development systems business is what made it less costly and take less time to develop with our architecture, even though we didn't have enough registers, and we didn't have enough address space.

Elliot: So time to market was very probably very impacted.

House: Time to market. It was the thing we could lean on when we went to the VP of engineering or the CEO of the company, in terms of saying, you're making a big decision and it incorporates all this stuff. And we had the industry beat.

You point out that the end circuit emulator allowed the customer engineer to pull the 8086 out and plug in this adapter that allowed you to put in break points, and traces, and do all the stuff in hardware at real-time speeds, these were largely real time systems, was so critical to be able to debug their systems and nobody could touch that.

Bader: PLM was a real solid language at the time. It was a lot easier to use than an assembler, for sure. It didn't have all the overhead of some of the older high-level languages. It ran fast, it really filled, I think, an important role in that transition period to when third party tools really started to take over.

Katz: The boards and development systems were in fact the major metric by which we measured a design win. You could get a letter from an engineering manager saying, we're going to use your chip. But only for certain customers would we trust that. But when they bought a development system or a board to start practicing with, that was a guaranteed design win.

House: That was the metric that we used.

McKenna: And the development systems were a metric. I remember, I think was Jim Lally who created a chart later on. The chart showed the rise of development systems and then the volume in chips.

House: Of the microprocessors.

McKenna: Yeah, of the microprocessors.

Katz: And it would follow by two years.

McKenna: Six months, or something like that.

Katz: Six months to two years. Well with the 8085s and other 8-bit processors, it was six months. But with the 16-bit processors, it was out to two years.

McKenna: Right, OK.

Elliot: You've talked about Motorola's reaction here. Does anybody have any comments on Zilog's reaction to being crushed?

House: Well having talked to Bernard Puto who was running the software over there. His comment was, they were trying to keep up with what you were doing. They were developing an 8-bit processor that was very successful, the Z80. They developed the Z8 to go after our embedded control processors, the 8048, 8051 series. Then then they had their Z8000 to go after the 8086.

Zilog felt they had a superior product in each case, but then they realized they had to provide the software. And they just didn't have the people. They didn't have the bandwidth. They they were trying to put this together on schedules that were just impossible with not enough resources. And they just couldn't keep up with that bandwidth. I think they even tried to do a development system, as I recall.

Katz: Yeah, but it was never very competitive. After the fact, we later determined, this was like two years or three years later, that as a result of Crush, we pretty much put the Zilog Z8000 out of business. We severely wounded the 68000 but didn't put it out of the picture.

House: It continued to have success. Well, Apple used it.

Katz: That was a perceived result by us. We perceived that we didn't have Zilog much as a competitor anymore at the 16-bit level. They were still killing us at the 8-bit level.

House: The Z80 continued. There are probably people still using Z80s.

Katz: And the competition in the 16-bit level from Motorola got squeezed down into a few reprogrammable only applications.

Elliot: Well Apple was one of them. Sun Microsystems was the other one, if I remember correctly. Sun used the Motorola Solution until the developed their own processor “SPARC”.

Katz: And wherever there was any amount of embedded control; Intel was winning it at the 16-bit level. We believe that was because of the Crush.

Remacle: All along, each one of you has told a kind of an anecdote or a story that was associated with Crush. Do you have any others that haven't been put on the table that you'd like to include? Jeff, you must have some you were at kind of the center of the whirlwind.

Katz: It was kind of a whirlwind. I would say it was among the top three or four years of my career in terms of stimulus and results. I felt pretty good about myself at the end of it. In particular, I became much better at defending my work to Andy.

Bader: Practice.

Katz: By the end of it.

House: Well the success probably made it easier.

Katz: And as I mentioned earlier, as the chief culprit at the beginning and also the chief beneficiary of the whole company getting behind my product, I went from a staff of five people to a staff of essentially 75 people, who were doing everything I needed to be done to make my product successful. And that was something that no other company or division within that company ever achieved as far as I know.

Remacle: And in what time frame did that grow from seven to 75?

Katz: Two weeks.

House: Well, wasn't exactly two weeks! But you had the license make it happen.

Katz: The major kick off meeting in January engaged everybody. And by the end of January, they were all working.

House: I remember drafting people and reassigning people left and right.

Katz: I don't mean permanently. The task force was working in my behalf, and largely at my, Dave's and the rest of our team's direction, the steering committee's direction. But I was the chief bureaucrat, feeling that I could finally change the world.

Elliot: And you did.

McKenna: Just maybe one note of dissonance is this was by no means an easy transition for Intel as a corporation, to move from the memory products into the microprocessor world. There were a lot of internal issues.

House: Andy wrote a book about it, Only the Paranoid Survive.

McKenna: It was also a problem for other Intel businesses. I remember Barry Cox was running memories, I think, at the time.

Elliot: I think so, yes.

McKenna: And they were really two sides of the house.

Bader: They were jealous?

McKenna: They didn't see a future for themselves, because so much of the resources were concentrated on something else. And Barry Cox was in Portland at the time, because we had an office up there and I spent a lot of time with him there. They were pounding the tables, wanting more attention, and wanting to know what their future was going to be.

I remember talking to Andy about it, and saying, you really need to make a decision here as to what's going on. He was trying to set up a meeting, he told me, between he and Gordon and Bob, to make some decisions about what the memory future might be, because it was a critical point at which we were either

going to go this way and be great, or be mediocre and try to be a little bit of everything. I think that's when Andy wrote about the fact that they made the decision that they're going to become a microprocessor company.

House: That really started the battle that went on from 1980 to 1985. Andy's book talks about the decision to get out of the DRAM business being in 1985 that being real decision process. That really launched it, because until that day, we were the afterthought of the company in the microprocessor.

We were just this little group of crazy people on the side, and the technology development guys weren't giving us the time of day, in terms of wanting lower resistant poly-silicon and two levels of metal. In those days, designing complex products was difficult because we only had one level of metal, and transistor characteristics.

It's was: just take what the memory guys are doing and figure out what you can do with it. And that really shifted the attention of the company into a battle that went on for quite some time over resources.

McKenna: It was a hard transition, but obviously a profitable one.

Bader: And from our view, in systems group, the memory systems and memory components didn't have a big presence in our business. We used memory chips, but that was it. But we thought that MIPO was the center of the universe and that's where everything flowed from.

House: We thought so too.

Bader: Well, you convinced some of us.

Elliot: I'd like to close with two things here. One, what were, fairly concisely, the lessons learned here?

House: Well for me it was the importance of selling and the importance of marketing. I think, Davidow particularly, really opened up my mind about marketing and about selling. Obviously Regis was our god, was the all-knowing advisor.

But Bill, I think with his experience at selling at HP as he indicated earlier, about changing the rules of the game, about not playing the other guys' game. If you're not winning in this game, change the game. I'd been an engineer all my life, and this was all new to me. Just the thinking that went into it, that came out of the committee, to me was transformational.

Katz: The other thing I learned, and I think that the company took advantage of, because the whole company learned it, was that you sold the whole system. You sold the whole solution. Not only the wonderful chip you have, but all the support chips, and all the software, and all of the example systems, and the development systems, and all the FAE support. All of that was part of the solution. And it was a big thing to sell, not just that little chip.

House: Before that, I remember we would be fighting between the business units to get the sales force's attention for memories, for systems, for single board computers, development systems, the various parts that made the solution possible. It was sort of like, who can get the sales force's attention? This was just going from vertical to horizontal in the approach, because now all of a sudden, it was a complete sale. It was a system level sale. It just changed the internal dynamics.

Katz: It became a much easier sell, because nobody else could do what Intel could do.

Remacle: It seems to me that it was also the customer realization, helped along by Intel by the way, and by press and so forth, that software upgradeability was important, that you couldn't change the architecture every time you came out with a new chip, that there needed to be cohesiveness in that realm. It wasn't just that Intel said it. It was that the customers got it.

Bader: Yes, and that's because of the increasing presence of software, where the hardware designs, which used to be the dominant part in cost, now became a smaller portion. And being able to move your software along from generation to generation became more important to protect that value of their investment. So I don't know if it was Crush that highlighted that, but certainly the transition of using microprocessors and more software-intensive environments led to that realization.

House: Note that before, everyone had, every generation had been incompatible, with the exception of the 8080, 8085. But this was true with Zilog, Motorola and Intel. But after that, every system was binary compatible going forward. And so it's not something that we had that was unique. We were just the first to claim that ground. We said, we are going to be compatible and all the 8086 software. It’s going to run, binaries are going to run, directly on the 286 and the 186. Of course, then it was Zilog saying me too, me too.

McKenna: I think we say the customers, but the customers needed educated. And I think this is where the seminars, and workshops became incredibly important. I think at one point somebody said-- I don't know if it was a customer or not, that Intel was providing more courses for customers than De Anza had on their yearly schedules. But we got involved in Intel in 1981. So we was there at the beginning.

Katz: No, no, earlier.

McKenna: 1971, I'm sorry.

House: '71, yeah. You were there when I came.

McKenna: So the first thing was a 4004. And I have some interesting early meetings about, what is a microprocessor? Why do we have it, all of those kinds of questions? So the microprocessor was 10 years in search of a market. But the technology kept moving forward. We were talking about Intel being at the beginning, components oriented but it was all these little operating groups doing different things that eventually came together.

We were torn between doing little piecemeal stuff all over the place. We were doing many disconnected things. We had to go to Europe. We put an early office up in Portland. We started operations in Phoenix. We were always being torn just doing things. This brought everything together. This really did. It was this whole idea that technology and marketing are two sides of the same coin.

Intel recognizing this and that recognition was really, really a major achievement, at least from my viewpoint.

Bader: To pile onto that, I discovered that it was the sales guys; it was the field that integrated all of this together, because they were the ones that were getting the messages from each of the different product groups. They had to pull all that stuff together in their head somehow and then present a set of cohesive product lines, which often weren't that cohesive, ideas and messages to the customers. In this case, The Crush Campaign, the factory in fact did get aligned behind that, and made that integration delivery easier.

Katz: We gave them lot of tools to do it, with the PR and the ad campaigns, and the literature campaigns, FAE training and all of that.

Bader: Right. The other thing I'll mention in terms of lessons learned is overwhelming force. If we did all of the same things Crush did, but they were spread out over two years instead of concentrated into one, it would not have had the same impact.

House: Really into six months. I mean, by the second six months, we were just in execution mode. The intensity was in December, January and February. By then we started to get into a rhythm. It was how we were operating, February, March and the balance of the campaign.

Katz: The seminar series was over by June.

House: And so it was really six months, but three months of unbelievable intensity.

Bader: So it's like advocating for heavy up advertising.

McKenna: Well it was intense.

Katz: But the ads went on all year.

McKenna: Yeah. But I just remember spending of my mornings at Intel, and my afternoons at Apple. And my evenings--

Katz: I could ask you which was more fun.

McKenna: --writing notes and doing work. No, no, I think this Intel was probably the most fun campaign, because Apple was--

Katz: It was doing well.

McKenna: I always called it a Woodstock. It was a happening. It wasn't a company. Intel was a company. There was an organization and a methodology and a process. Apple wasn't that way.

Katz: At another time I'd like to have a video history of your time at Apple.

House: That would be good.

McKenna: I've written it.

Bader: Have you?

McKenna: Yeah.

McKenna: You know the old joke about what's the difference between Apple and the Boy Scouts? Boy Scouts have adult supervision.

Remacle: I think we're wrapping up.

Elliot: I guess we'd like to end with a final statement from each one of you relevant to Crush success. Are there any final comments that you'd like to make?

House: Well I guess it was a turning point. It was an unbelievable amount of teamwork, intensity brought on by the fact that we believed our corporate life was in danger and we had to do something. I learned so much dealing with the systems side of the house during that time. Bill Davidow's leadership was impeccable. And the team just pulled behind it.

The bureaucrats made it, everything; happen on time and on schedule. And you were a great taskmaster relative to that. Jim Lally was always a fountain of ideas, a phenomenal guy to work with. But it's hard to look back and find a better team than we had at that point in time. You think of the teams you've worked with your career, it's hard to top it.

Katz: I would second that a hundred percent. It was, as I said, one of my highlight years in my career, teaching me the marketing profession, at least “business to business marketing” and witnessing the energy and capability of Intel at the time, all come together essentially on my behalf.

Remacle: How old were you at the time?

Katz: None of your damn business.

Remacle: I'm not going to reverse calculate, but I know when we did the 386, one of the things that came out of the 386 oral history, one of the things that came out of it was how incredibly young that team was.

House: It was a very young team.

Katz: I was 37 at the time.

Remacle: So you were an older guy.

Katz: I was. I was an elder statesman at Intel.

Bader: I was 28.

House: I was 15.

House: I was 37 as well.

Elliot: Rich?

Bader: So I'll echo this, there were more smart people per cubic meter at Intel than any other company I've ever been at.

Katz: At least at that time, I don't know what it is now.

House: None of us knows today.

Bader: But certainly at that time this was true. But it was usually around the technology and the engineers. So to find this marketing expertise within the company and be able to really see what value marketing could bring to an organization was an amazing experience. I'm still running a company up in Oregon. And what I've been doing is taking notes about the relevance of Crush for the market I'm in today. We've got a new suite of services. We need to be selling to the C level folks. I'm aware of that. But all of these nine programs, tools and tech, we are just started doing some advertising and sales incentive program. So where did I learn all that stuff? Here, 30 some odd years ago.

And so I need to take it up a notch. I'm talking to myself about that level of intensity and hitting it a little harder. But man, the lessons I've learned and Intel, Crush, and elsewhere are the things that have informed our lives forever. Wonderful stuff.

Elliot: Regis?

McKenna: I would just second what everyone else has said. I think the one thing that I would bring up, is that it was fun. It really was. You were engaged but it was, despite the fact that there were a lot of taskmasters, starting with Grove, it was absolutely fun. You enjoyed being part of it. You enjoyed the access level that you were able to get any resources or access anybody who you needed to do whatever you needed to get done. There was no sort of hierarchy you had to go through.

I can't tell you the number of times over the years I've used Crush as an example. I'm on six startup boards. I bring it up, I'll bet, once a week. And still do. I mean, about certainly the intensity level, about the fact that the management has to get involved in the marketing aspects of things.

And so much so that I think this really was a milestone for many things. Not only for Intel. But I also think in the world of technology and marketing.

Remacle: You sit in a position that you can make that judgment probably better than anybody else in the room.

House: You've been involved in so many great technology companies.

McKenna: But I think that people look to Intel as a great marketing company. I think they do. Not only because of this, but I think this set a precedent. Later on, Intel certainly went well beyond anything that we had probably imagined.

Katz: The first high tech company to market to end users, for example.

McKenna: Yeah. I think it was a unique experience. And I think we all gained an immense amount of value from it for the rest of our careers.

Elliot: Any last comments?

Bader: Thanks for doing this.

Elliot: Gentlemen, thank you for doing it.

House: Yeah Dane, you did a great job of pulling us all together.

McKenna: Thank you both.

END OF INTERVIEW

