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## DxR Case Study

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## **D<sub>x</sub>R CASE STUDY**

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**CASE STUDY**

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## Editor's Notes:

1. This on-line case study was developed by Professors Carol Saunders, University of Oklahoma, Center for Management Information Systems Studies, and Blake Ives, Louisiana State University. The case is designed to explore a number of issues faced by managers of Information Technology (IT). These issues include inter-organizational alliances, project management, management of IT personnel and commercial use of the World Wide Web.
2. A timeline to help students follow this case is included as Appendix F.
3. The .pdf version contains the entire text in linear form. The .html version uses the capabilities of the Web to present the case in hypertext form and includes photographs.
4. Faculty members who are listed in the IS Faculty Directory, located on the Web at <http://webfoot.csom.umn.edu/ISWorld/FacDir/default.htm> can send an e-mail to one of the authors ([csaunders@ou.edu](mailto:csaunders@ou.edu) or [bives@lsu.edu](mailto:bives@lsu.edu)) requesting the teaching note that accompanies this case.

## PREFACE

In July 1998, Hurley Myers, President of DxR Development Group, stared at the gray plastoid brain lying on the desk before him. A prop for the medical multimedia software his firm developed, it also was a suitable metaphor for the many critical decisions that he faced. Complicating these decisions was his uncertainty regarding the intentions of his partner and biggest customer, a large pharmaceutical company. For the next six months, the customer had the option either to buy DxR out or to release it from its contractual obligations. If it chose the former, it might do so just to obtain the intellectual property rights controlled by DxR. This option might permit DxR to start up again in the medical education

marketplace, but without its biggest customer and much of its intellectual property. With either the restart or release option, DxR would need to adapt to the major change in orientation. The change would encourage DxR to identify new customers and new product opportunities and create new strategic alliances. If any of these options resulted in further growth, Myers knew that some of his management team felt more rigorous procedures were necessary for software development and human resource management. Myers also felt that DxR's pharmaceutical partner needed to be making greater use of the Internet for marketing, and perhaps distributing, DxR's products.

**Keywords:** inter-organizational alliances, World Wide Web, project management, management of IT personnel, case study

## I. INTRODUCTION

DxR Development Group, located in Carbondale, Illinois, was the vision of Hurley Myers (Ph.D.), a member of the medical school faculty at Southern Illinois University (SIU). The SIU medical school was started in 1970 in reaction to the excessive research orientation then adopted in most American medical schools. The focus of SIU's medical school was quality teaching. Dean Richard Moy, the school's first Dean, explained: *"It was time for reform and revolution in medical education. I recruited faculty who would be good teachers. And Hurley Myers was the quintessential teacher, the type of new Ph.D. that I wanted to attract. He was burning with ideas and the desire to teach"*.

In the mid-1980s, the medical school was the first in the nation to institute a new learning process that was more problem-oriented. It partially relied on case booklets describing clinical situations. These cases were used to challenge a student's problem-solving skills. Myers felt this approach was a natural application for the computer as it would permit students to go down multiple paths during their analysis, and for faculty to trace the process by which a student arrived at a particular diagnosis and treatment plan.

Myers teamed up with Dr. Kevin Dorsey, an SIU clinical faculty member and physician who provided much of the content for the computerized case simulations. Myers assigned student laboratory assistants to create the computerized versions of the case. Using Hypercard, a new tool available only on Macintosh computers, the students developed several computerized cases that were based on content provided by Dorsey, Myers and others. Although still somewhat crude, the cases were well-accepted by faculty and students at SIU, as well as at conferences where Myers presented diagnostic simulations.

### **AFFILIATION WITH MEDICAL SCHOOL**

Myers and Dorsey began discussions with the Dean of the Medical School, who was intrigued with the possibilities. The medical school, with strong encouragement from Dean Moy, had been involved in innovative education since its inception. Dean Moy saw affiliation as a logical extension and agreed to provide funding if Myers could get supporting grants from external sources. Soon thereafter, Apple Computer provided a grant for hardware and Myers received a \$30,000 grant from the Technological Commercialization Center (TCC), an Illinois agency designed to encourage high-tech start-up companies. Typically TCC funding had not been awarded to companies affiliated with a university, but the agency made an exception because it felt that the grant to DxR would promote TCC's technology transfer goals. Myers used the external grant money to hire Eldon Benz, a programmer whom he had met at a Macintosh user group, as well as a technical support person who was assigned to enter the clinical contents.

The first project was patient simulation software that allowed students to practice the patient encounter, conduct the examination, and order the laboratory work. Upon reviewing the students' actions, the professor could assess their clinical ability.

It soon became clear, however, that the cost to develop such a product could exceed the expected revenues. Worse, a shortfall in the budget of the State of Illinois led to a \$500,000 cut in the Medical School's state funding. In early 1992, facing these financial hardships, the Dean was forced to reevaluate the use of foundation money for special projects, including the patient simulation project. He decided that: *"Hurley's fertile mind could spend any amount of money that I could give him. His ideas were good and he needed to be cut loose."*

But after cutting Myers' funding, the Dean negotiated an agreement with the university attorneys and transferred the product's intellectual property rights to Myers. In another gesture of support, he returned money already received from institutions seeking to buy the product from SIU, encouraging them to buy it directly from Myers instead.

## **MOVING TO BUSINESS INCUBATOR**

Myers had already seen enough positive customer response to know that the product had potential. He formed a partnership with Dorsey and Benz. DxR Development Group, Inc. was incorporated in July 1992. The fledgling company used its TCC connections to rent a single room in the university's business incubator to set up shop. According to the forgiving agreement, the rent could slide a month or two as long as it was paid up at the end of the year. Using the university's phone system created additional savings. Also, the location was convenient to Myers' classes. There were some caveats, however. For instance, the university attorney advised Myers to avoid having his calls from the business come to his faculty office and conducting other business-related activities there as these would be viewed as using the university to conduct his private business.

## **II.FOLLOW-ON PRODUCTS**

DxR released the patient simulation software in 1992. The company's business plan projected continuing to develop the patient simulation software.

But the simulation software was not selling as well as the company's founders had hoped. Myers described his frustrations at the time:

*"It was obvious that we needed to find a product that everyone needed. While clinical simulations represented a good type of product, there were too many alternatives. Paper-based alternatives were readily available in the market. There were also problems because of the infrastructure of most medical schools. The infrastructure to use the software as an integral part of curriculum was not in place. Medical schools could put it out as part of a learning resource center but not as required assignments."*

It soon became clear that DxR would need another product to tide the firm over while that technological infrastructure was being developed.

## **NETTER MEDICAL ILLUSTRATIONS**

DxR's second product also grew out of Myers' teaching experience. A popular basic electrocardiography text in Myer's cardiovascular medicine class featured artwork by a very well known medical illustrator, Dr. Frank Netter. The text was one of the best selling books about electrocardiography in the world. The pharmaceutical company, CibaGeigy, owned Netter's illustrations and the collection was valued at approximately \$40 million dollars.

Myers described the germination of DxR's second product:

*"I was on my way to a class and it occurred to me that Netter's text on basic electrocardiography would be a wonderful book to put on a disk. I called the right guy at the right time – he gave me \$2,500 to create an illustration of what could be done. I needed the money to pay the programmer. I parlayed that into a \$150,000 investment before it was over."*

After that class, Myers picked up the phone and called the manager of the medical education program, Phil Flagler, at Ciba Geigy. With that call, DxR laid the cornerstone of a relationship with CibaGeigy, and later with Novartis, formed from the merger of Ciba Geigy and Sandoz.

## **THE INTERACTIVE ATLAS OF HUMAN ANATOMY**

DxR's next digital product, the Interactive Atlas of Human Anatomy, was completed in a record time of eight months and was even more successful than the commercially viable Interactive Electrocardiography CD. This atlas added value to the best-selling book illustrations was its provision of navigational tools and educational features. German and Portuguese versions were subsequently started. The success of the original interactive atlas prompted the development of two other atlas projects: The Interactive Atlas of Clinical Anatomy and the Interactive Atlas of the Central Nervous System Anatomy. The Central Nervous System capitalized on earlier versions of the Interactive Atlas of Human Anatomy. DxR was able to pull out portions relating to the central nervous system to develop give-away products that Novartis Pharmaceuticals could use at trade shows. DxR anticipated developing cardiovascular, rheumatology, and respiratory atlases using earlier products as models.

In building the interactive clinical atlas in 1996 and 1997, DxR pushed the Wintel platform development tool, Toolbook, to the limits. The clinical atlas was quadruple the size of the original product and Toolbook did not scale up well with the increased data requirements. Furthermore, DxR developers found previously unencountered bugs in the tool. They were in frequent contact with Asymetrix, the developer of Toolbook, who kept reassuring them that the size limit, while untested, was much higher than DxR's requirement. DxR was in the eleventh hour and concerned that it would be unable to deliver the atlas on time.

DxR did not disclose its plight to Novartis until the deadline neared. Robert Wright, DxR's project director for the clinical atlas, felt caught in the middle. Members of his team were upset because Novartis had not previously been informed about the problems. Furthermore, the team members were being pressured by management who had described this as "do or die" for DxR. The



team did find work-arounds for Toolbook's limitations, but exceeded their deadline.

Meanwhile, Novartis had outsourced the development of a marketing demo for the Clinical Atlas Version 1.0 to an advertising company. For this demo, the advertising company developed a self-running presentation describing the Clinical Atlas. However, Myers, who had not been informed that another company was developing the demo, was disappointed that it was not interactive.

Version 1.1 of the atlases, including fixes of Version 1.0's bugs, followed immediately on the heels of Version 1.0. Major changes in medical terminology motivated the next version of the clinical and human anatomy atlases. DxR started Version 2.0 in October of 1997 and it was finished, according to the original specifications, on February 1, 1998. DxR coordinated its work with that of the Novartis staff who were making similar changes to the book version. Since Novartis was short on staff, the product's delivery date was pushed back. The version release was further delayed by Novartis to add functionality that permitted users to see the female anatomy from a number of views (e.g.,MRI, top down, Netter diagram). The Clinical Atlas Version 2.0 was restarted in April and finally completed on April 24, 1998. In 1998, the Software Publishers Association nominated the product for the "Best Debut of the Year."

## **OTHER PRODUCTS**

Other products (Appendix A) soon joined the DxR patient simulation and Atlas series software. The Postclerkship Examination (PCX), customized examination software developed for SIU's fourth year medical students, was a derivative product of DxR patient simulation software. Atlas derivatives such as the Interactive Atlas of the Central Nervous System were specially designed for Novartis' Pharmaceutical Division, and atlases in German and Portuguese were developed. In the summer of 1998, DxR undertook a project about congestive heart failure as part of the NovaCon series. Other projects, such as products on diabetes and irritable bowels, were scheduled to join the series. In addition to products designed for Novartis, DxR produced third party products for such

groups as the Mayo Clinic and Northstar Hospital. (Appendix B describes this project further and Appendix C describes the technical support role.)

### **III. THE DEVELOPMENT ENVIRONMENT**

By the summer of 1998, DXR employed 23 people on a full and part-time basis. Figure 1 shows the organization chart at that time. The President and cofounder of DxR Group, Inc. is Hurley Myers. Two people (in addition to the secretary) report to him: cofounder and Vice President of Programming, Eldon Benz, and Vice President of Production, Robert Wright. The four software engineers and two technical support staff report to Eldon Benz, while the three graphics artists, audio support person, editorial support person and four project directors with their software support personnel report to Robert Wright. Note that by Summer 1998, Dorsey had sold his share of the business to Hurley Myers.

The staff worked in a mixed computing environment as most products needed to be made available for both Wintel and Macintosh platforms because the latter was still in heavy use in many educational institutions. Each project had a development team comprised of editors, graphic designers, programmers, customer support personnel, and individuals with medical experience and led by a project director. Robert Wright, as Vice President of Production, oversaw the group responsible for developing content. Eldon Benz, one of the co-founders, was in charge of programming, though he was most familiar with the Macintosh environment.

Process and human resource issues constrained the development environment.

# DxR Development Group, Inc. Organizational Chart

Effective 4/13/98

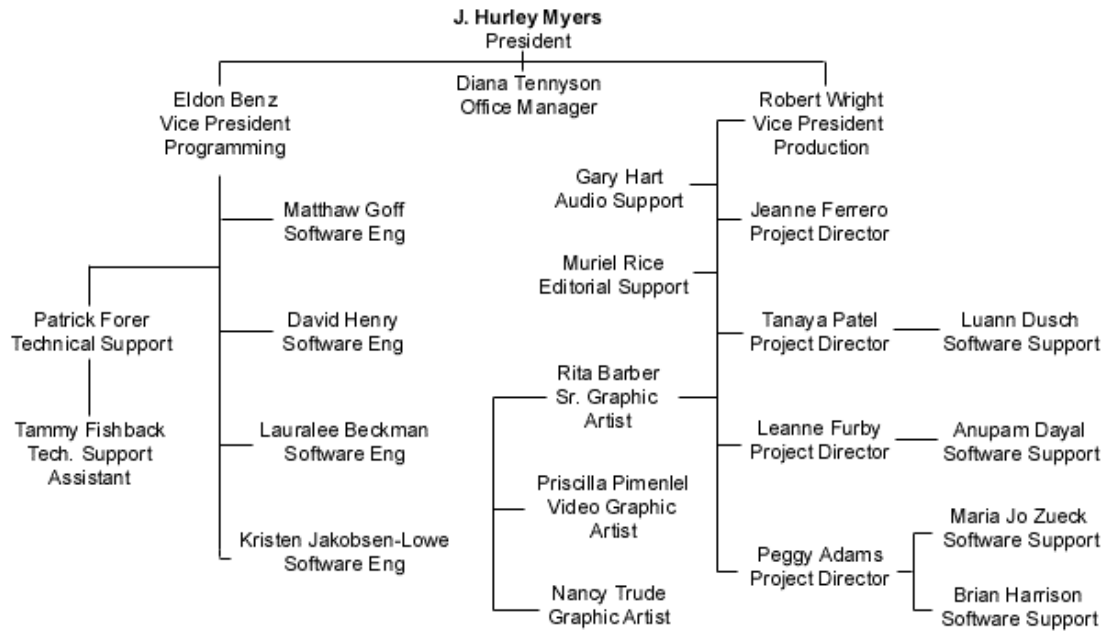


Figure 1. Organization Chart

## THE DEVELOPMENT PROCESS

### Deadlines

DxR prided itself on its development speed. However, there were challenges to completing projects on schedule. Richard Klein, the previous head of the medical education division at Novartis explained,

*"The biggest problem for my folks was timelines. DxR's timelines came and went. This is probably because Hurley was overly optimistic about timelines. We had to give distributors six months notice so they could promote the products in their catalogs. I was*

*unhappy when we did not meet the promised timelines. This happened a few times and then we started building in buffers."*

Deadlines were also a major source of frustration for DxR staff. Robert Wright, Vice President of Production, explained:

*"At first, DxR didn't give estimates about how long it would take to develop a product since they had never developed a similar one. DxR found it difficult to make good estimates. More recently, Novartis tends to set a date that is often driven by marketing needs. But then, either because there is no pressure at their end or because we need the time, they give us an extension. That is disheartening to our people who had worked hard to meet the initial deadline. Novartis gives us a date and then changes it. Now I am in contact with people at Novartis, so we have a better sense of what is happening."*

Craig Yarwood, Novartis' liaison with DxR from 1996 to 1998, confirmed that Novartis' actions impacted DxR's deadlines. He explained: *"DxR's delays to deadlines were due to a number of factors. One was the lack of upfront definition on Novartis' end. But DxR was flexible. They desired to make the product the best that it could be. In publishing, you can go on forever when trying to improve the product."* Yarwood wanted to build enough time into the schedule to review the product adequately prior to release.

## **Access**

The artwork to be included in an atlas was first designated by a content specialist - for instance, a particular view of a heart appearing in the hardcopy version of the atlas. Novartis personnel were informed of the need and then retrieved the artwork based upon the content specialist's specifications. Unfortunately, several Novartis employees who were familiar with the artwork had retired or been reassigned. Those individuals who were still available had to

drive about half an hour to reach the collection which was stored offsite. They would then forward the artwork to DxR where it was digitized. In lieu of experts, the custodians relied on registration numbers in a paper catalog. In DxR's first atlas, registration numbers were not mentioned. The content persons went through all their books and requested artwork as, *"I wanted the image that appears as plate xxx on page xxx of book YYY."* When the Clinical Atlas was developed, the lack of registration numbers became an acute problem and contributed to delays.

*Registration*

Registration is a technical term that refers to the number used to index a piece of art in the Netter collection.

Finding a particular piece of art among the 5,000 piece collection presented another accessibility challenge. Novartis custodians had not always returned artwork to its proper location after it had been digitized or photographed. Some parts of the collection were indefinitely on loan, while still others were damaged.

D&R had similar problems with many of its own files. Wright admitted, ruefully:

*"We have learned the hard way that we have to organize lots of things better – not just art, but also source code and so on. Everything is backed up. The majority of the work in progress including the digital images has been archived. You can do a text search to find out what CD something is on, but the indexing is minimal."*

Wright wanted to develop a relational database to be shared by all of the DxR staff. Information about artwork identified so far included: name, storage location, project used on, changes and layer. The need for a good indexing

system for artwork had become painfully clear in attempts to reuse the graphics interface from a version created two-years previously for a Portuguese version of the atlas. Wright explained:

*"To modify the language of the interface the developers needed to find an icon strip that is still in layers, and then change the text component. For instance, in the original PhotoShop artwork, the text elements of the interface appear on different layers than would the color of the button or its shape. But, the layered images take up massive amounts of space, so only the "flattened" version is actually stored on the product CD. The flattened version can not be easily updated, while the layered one is simple to change. But, when we go into the archive to look for the layered version we may find a hundred different icon strips from the same project."*

Patrick Forer, a member of the DxR Technical Support staff, echoed Wright's concerns about accessibility in an interview:

*"We don't have a consistent way of storing source code or images. We have a server, but it is a garbage heap. We have never had a priority for thinking about our data. People have multiple versions and may not know which is the best one. You may not necessarily want the most recent version as an older version may have eventually been used instead. Naming conventions are vague. There are over 200 CDs in the archives. We are trying to create a comprehensive policy. However, we do not yet have an integrated approach to managing and storing data. We have patched together an approach, but it is not planned at the highest level. We have not invested energy in it. We waste a lot of time in-house."*

## Controls

A third development challenge focused on controls. Although, as shown in the Organization Chart in Figure 1, the chain of command was clear-cut, controls at DxR were relatively loose. One team member noted, *"There is a big learning curve for all our employees, and much is demanded of them."*

Wright felt that tighter controls could lead to poor morale:

*"People have to pitch in to do a job. They give up their free time. When the project is done, we hope that people will have some ownership of it. People get excited about what they are doing. For better or worse, we are a little less disciplined than you might have expected. This is a dangerous way of doing things, in my opinion. The hardest thing in my job is that there are certain areas where we need very strict controls – say, in backup. We have lost major time, because things were not properly backed up, or cataloged. This looseness worked out very well when I was first here and there were half the number of people. But, the more we grow, the more difficult it is to maintain that enjoyable atmosphere. We have less and less overlap, where people are aware of what one another is doing. This makes it more of a problem when people leave."*

Forer thought some things were being left to too late in the product development cycle.

*"Deadlines are much too short for managing the projects. A lot of time the engineers are focused on their project so they let slide the development of the utilities the customer uses to set up the product on their own computer. Often they will do that on the last day and then we see the products going out with problems. I think it is a mistake to have the first thing the customer is going to see be completed on the last day before the product is shipped."*

Testing and release control were also identified as problems by Forer:

*"The testing process is too informal. Unfortunately, no one is assigned to it and it occurs too late in the process. And, there is no release control; sometimes we turn new releases out two or three times a day."*

While the lack of project controls created problems, it was consistent with Myers' philosophy of "creative disorganization." Myers explained:

*"When decisions are being made on a day-to-day basis about what should be included in a particular product, everyone has an opportunity to participate. We only define upfront about 20 to 30% of the specification. We don't go into a room and tell people how it will be. Rather, we go into a room and let everyone have an opportunity to participate in the design. I have the final decision and if what they want to do is as good or better than what I wanted to do, then we do it their way. If, on the other hand, I see positive long-term implications of doing it another way, then we do that. People from the outside, including our editors at Novartis, see this as problem. They are looking for someone who is more traditional in the process of software development."*

Richard Klein, president of Novartis from 1995 to 1996, encouraged Myers to perpetuate the loose project structure: *"The employees were happy working in a loose environment. I think DxR would have gone down the wrong route with more structure. You want a Bill Gates kind of environment. Where is that fine line that lets people be creative?"*



## Coordination

Content specialists were often located remotely from DxR, as were its editors at Novartis. So too were the individuals responsible for retrieving the Netter artwork. Novartis editors interfaced, on many projects, between DxR and content specialists. Even within DxR's own environment, coordination became more difficult as the product mix became more complex and additional people were hired.

As Novartis president, Richard Klein worked to promote coordination between DxR and Novartis:

*"We found early on that when you are physically separated like we were there had to be a process of communication. People had to be empowered to communicate. We tried to make the communication as direct as possible. I established project teams for marketed products and those in development. The teams included someone from DxR. The teams would have meetings about once a week and communicate with the person at DxR over the phone."*

But Klein was quick to note problems with this coordination mechanism:

*"I am not suggesting for a minute that communications were ideal. Hurley has very young people who are not experienced in these things. But once you start talking about project teams and business teams or making decisions that go beyond your expertise it becomes more difficult. Hurley couldn't be our only contact. Everyone in my group was trying to call Hurley. This was neither efficient nor effective."*

Robert Wright wanted to improve DxR's approach to project management. But he wasn't sure whether improvements could be made without inhibiting DxR's creativity or making it more difficult to work on projects with Novartis.

## Human Resources

Staffing was another challenge. In the Carbondale market, DxR faced difficulties finding applicants with programming experience. Many were former students or spouses of students or faculty.

Ray Lenzi, Director of the business incubator, concurred that many prospective employees were spouses who had found themselves captured in Southern Illinois. Increasingly though, Carbondale had become an option for people who graduate from universities, especially SIU. He explained, *"The lower salaries and less urbanization must be balanced against the lower cost of living, lack of crowding, and beautiful environment. The conundrum is that economic development in rural areas leads to urbanization that is less appealing to those in the area."*

Many people hired by DxR as programmers did not have computer backgrounds. And, one graphics artist who did not have previous computer experience admitted, *"I saw this job advertised in the paper. I didn't think they would hire me because I didn't know how to turn on the computer. And they hired me, much to my surprise. It has been an incredible learning experience. I learn something on a daily basis. .... I absolutely love my job. I'm incredibly lucky to be in southern Illinois and have a job like this. It makes me feel good to be developing health education media."*

Muriel Rice's experience was very similar. An interview with her is included as Appendix D.

Since the new hires typically did not have the requisite skills and experience, Wright felt a 90-day probationary period was critical. However, he also felt that DxR had not always used clear objectives in managing new hires. New hires knew generally what was required of them, but specificity was often missing. Wright explained:

*"Myers always makes it clear what he expects of them, but he gives them an overview rather than specific instructions. Without clear objectives, in concert with adequate training, it is difficult to provide objective performance reviews. Because of his teaching background, Myers shepherds everyone. He wants to bring the best out in all of us and to develop skills in new employees. As long as they are willing to learn and excited about what they are doing, Myers supports them."*

Wright felt this made it difficult for him to establish discipline and controls.

DxR also applied for several grants with matching funds for training purposes. Ray Lenzi helped DxR ("an incubator dream") write a training grant proposal that was turned down by the State of Illinois because DxR was not a manufacturing company. In the summer of 1998 he helped DxR write another grant to cover the direct cost of training and travel to the training site.

## **IV. NOVARTIS/DXR ALLIANCE**

### **PHIL FLAGLER YEARS (1992-1995)**

The Novartis/DxR alliance underwent considerable change since its inception. Myers had worked well with Novartis' Phil Flagler for a year and a half until Flagler took early retirement in 1995. *"When Phil Flagler retired, I thought it was the end of road there for us," said Myers. "But, I called and got the name of Phil's replacement, Richard Klein, and set up a meeting. It was not a particularly good one. He was a financial expert who knew little about publishing. He was interested in the business side. This wasn't surprising as this was one of the few pharmaceutical companies that had a medical education arm, mainly because of the Frank Netter illustrations"*

## **RICHARD KLEIN YEARS (EARLY 1995-1996)**

Richard Klein faced a daunting task when he took over Flagler's position as Executive Director of Novartis' Medical Education and Publication Division. His charge was to turn a division that was consuming millions of dollars into a profitable unit. At the time, the medical education division was a support function and its publications were being given away to physicians as a marketing tool.

Klein felt that he and Myers complemented one another very well. Klein provided Myers with insights about business issues while Myers educated Klein about the technology. Eventually Myers persuaded Klein to evaluate the automated atlas's potential. After careful consideration, Klein decided to pursue the basic cardiovascular package. With CibaGeigy's financial support, DxR developed a product with commercial potential. The product did well in the medical education market. DxR's modest profit from the product substituted for equivalent funding CibaGeigy had contracted to provide to DxR. DxR profits were plowed back into the business.

Klein's belief in the product pushed aside his earlier skepticism. He became DxR's greatest champion at Novartis. He supported DxR and its creative ability, even though privately he occasionally chastised Myers. He worked with Myers to write a three-year contract (described in Appendix E) that benefited both DxR and Novartis.

## **CRAIG YARWOOD YEARS (1996 TO LATE 1998)**

In 1996, Klein unexpectedly left Novartis. Peter Carlin was brought in from the outside to replace him. Craig Yarwood, a recent MBA graduate who also has a MS in Pharmacology, reported to Carlin and became Myers's new contact. Yarwood proved to be even more interested in the bottom line than Richard Klein had been. Yarwood was also interested in instilling more control into the development process.

Yarwood spoke very positively about the DxR/Novartis Alliance:

*"From Novartis' perspective, DxR has been an invaluable partner in helping position Ciba and Novartis in medical education...Novartis is now not only in the traditional book market, etc, but also it is increasingly technologically competent and leverages different media in the educational process."*

*"One of the strengths and weaknesses (or now an opportunity of the relationship with DxR) is that DxR in multimedia development processes works with a thought process that is very different from the traditional publication model. There is a dichotomy in the way DxR and Novartis develop products."*

*"To clarify what I mean about the dichotomy let me give you an example. In the publishing industry, products are developed around manuscripts received from authors. You work with author and there is no intermediary. In multimedia publishing, though, there is an added element. You have to work with both the author and the instructional designer. Early in multimedia product design, we had tried to apply the publishing approach to a non-linear publication. Novartis' strength is being able to battle through the traditional editorial approach. Originally it was difficult to lay out patterns and content with the traditional approach. This is improving with every new project."*

*"Early on this dichotomy was a detriment. The two companies didn't understand each other. Now the two companies have capitalized on the differences and the dichotomy is perceived as an opportunity. They are more closely aligned now. They know each other's strengths and weaknesses."*

*"Without their partnership, neither DxR nor Novartis would have evolved to its current level. Although I have indicated a challenging development process exists, it is because of this intellectual tug of war that the end products are generally considered superior to anything similarly available."*

## **STRESS IN THE RELATIONSHIP**

Despite the benefits derived from the DxR/Novartis alliance, Wright saw signs of stress in the relationship in early 1998:

*"As far as I know, there is no money being spent on marketing the DxR company. When Novartis web site went online, we weren't mentioned. That was pretty disappointing. There have been a lot of hints recently that Novartis wants to sever our relationships."*

Cofounder Benz also predicted that a change in the Novartis relationship was likely *"because of change in Novartis' focus... change in personnel; perhaps they don't see the benefits of having their name on computer software."*

In the spring of 1998 Novartis dropped a bombshell on DxR. As Myers explained:

*"The folks at Novartis had been making a lot of noise about how tough the market was and how their business was changing. While I was in a meeting with Craig Yarwood in Tampa, he suggested Novartis was going to cut back on development of new products ---- a move that would directly impact our budget. A couple of days later Craig called to tell me Novartis had mandated a 20% across the board cut because two drugs were not doing as well as they had expected. In addition to our budget cut, we would now lose potential add on business from pharmaceutical divisions businesses that would not be as willing to pay for value-added products."*

Yarwood also indicated that Novartis' and DxR's different development process had created some stress in the relationship. He described DxR's 'creative disorganization' as *"exasperating, frustrating and exhilarating all at the same time. DxR had provided a novel approach to development which has facilitated Novartis' development growth. At the same time, the injection of Novartis' publication and editorial experience has put more structure into the DxR development process. But we're still not entirely on the same page. DxR tends to develop a project more on the fly. Novartis tends to use more of a traditional publishing project approach."*

Yarwood perceived that DxR did not use the storyboard approach typically used at Novartis, and that usually only 10% of DxR's projects were specified prior to the start of programming. Novartis wanted a larger percentage, say 75%, to be established prior to the start of the programming effort.

## **QUALITY PRODUCT AT LOW COST**

Myers felt that DxR was able to deliver quality products at a lower cost than most of its competitors. Klein concurred with Myers' assessment. He said, *"There is no doubt in my mind that DxR was the high quality, low price provider. I know what DxR paid people. It is somewhat apples and oranges to compare salaries where I live in New Jersey to Southern Illinois. Hurley's people were working 18 hours a day and sleeping over, trying to make deadlines. They were producing high quality materials at a good price."*

In early 1997, Novartis decided to digitize and catalog over 5000 Netter paintings. Novartis put out for bid a project to create a digital screen and print version of the collection. DxR put in a bid to do part of the project. Wright described the result:

*"We were probably the lowest bidder, but we were not considered. We did not have the equipment or experience. They hired a company to do some of the work, but apparently did not give out the entire contract. It appears that the project has turned out to be a much more expensive proposition than Novartis expected. Last week they told us that they're now thinking of going out for a new supplier. They want print quality as well as multi-media, so the project would be very expensive – perhaps as much as \$1,000,000. Of course, we could use the equipment on other projects."*

Novartis had done more than bankroll DxR's product development. In 1997, Novartis decided it could make a profit by distributing and collecting sales revenues for DxR's simulation product. To make the product profitable, Novartis raised the price of the entire series of 58 cases from \$15,000 to \$40,000, or \$1,000 a case. Myers was not enthusiastic, but thought that the support to maintain the product, in addition to the royalties that DxR received, offset the disadvantages of the price increase. Novartis undertook an extensive marketing campaign and planned first year sales of \$200,000. Instead, it realized gross revenues of \$240,000, of which DxR's share was \$100,000. This money was used for maintaining the current software and developing new cases.

Myers devoted considerable efforts to maintain the alliance with Novartis. As the contract with Novartis neared the end of its life, he wondered what strategy he should adopt for DxR's future. He knew he needed to decide the extent to which DxR's future would be linked to Novartis.

## **MEDICAL EDUCATION SOFTWARE MARKET**

Both DxR and Novartis were aware of the inherent risks of the medical software market. Wright described the competitive environment:



*"The market is small and there are lots of competitors developing software products."*

DxR's main competitors were Adam Software, Gold Standard and IVI Publishing. Adam was a publicly traded firm with a product characterized by expensive artwork. Gold Standard was founded by an MD with an initial interest in anatomy. Its main product used cadaver pictures and labels. Interestingly, Gold Standard in the spring of 1998 began marketing and selling Novartis software, including that produced by DxR. Gold Standard developed, published and distributed medical education software.

In addition, many small companies with innovative products using the visible human data had sprouted up. The visible human data was obtained from a federally funded project. Researchers at the University of Colorado, funded by a grant from the National Library of Medicine, took thousands of high-quality, digital pictures of slices, about every millimeter, of a male's and female's body. The man, who had been executed for murder, donated his body to science.

The visible human data was readily available over the Internet at no charge. Several companies were using it to create value-added products. Gold Standard was using the data to produce a virtual human studio that allowed a viewer to define a region or organ and pull it out as a three-dimensional model that can then be looked at in a variety of ways.

DxR was also using the visible human data in their products. They paid less than \$500 for a CD that had all the high-resolution axial (top down) cuts. Through a computer-based process, DxR then developed other views of the data. Novartis quickly learned the benefits of providing more cross-sectional data. But observers felt that, the real value of their products is derived from the Netter illustrations.

To compete in this tight market, DxR realized the potential benefits of alliances. But, it was difficult to find alliance prospects, either long-term clients or partners, with ideas and deep pockets. However, alliance prospects were not totally out of the picture. Myers described one major client:

*"We were contacted by an emerging biotech company called Cephalon which engineers enzymes and genes to produce healthcare products. Cephalon was working on a product called Myotropin to treat Lou Gehrig's disease. Cephalon wanted us to work with a famous neurologist to support the marketing of their new product. They were willing to pay \$250,000 for it and we could do it for considerably less than that amount. Then, the FDA squashed their product. I charged them for just our time, \$10,000, which surprised them. I told them we wanted their future business."*

#### **IV. DXR AND THE WORLD WIDE WEB**

By the summer of 1998, DxR had become interested in exploiting the World Wide Web. Wright wanted to set up a DxR website, which he felt would be an inexpensive way to promote DxR as an entity separate from Novartis. The website could capitalize on DxR's reputation as a medical education software specialist. However, he saw some hurdles to be overcome in using the web as a distribution channel, as he described:

*"Our products are so large (some as big as 650 megabytes) that they would require days to download. I have been going to Software Publishing Association conferences. There, they always discuss what is an acceptable size for downloading, given current bandwidth limitations. The acceptable size is slowly getting larger with new connections and technology. People are more and more willing to wait. At the upper limit, people will download a 15 or 20 megabyte file. But, most of our products are over 100 megabytes. This may be too large. And the time required to download is not the only factor. Connection problems during the download might mean*

*that you have to start over a number of times before you are successful."*

A number of other hurdles existed for DxR. One of the greatest was obtaining Novartis's permission. Novartis wanted to protect the software and avoid piracy. At the same time, Novartis didn't want to upset its distributors or customers.

DxR's Wright proposed to Novartis both marketing via the web and using 'Try and Buy' technology. The latter required offering customers a demo of the full working product on the disk. A customer could use the product for a number of days, or sign-ons, or usage of modules. The software would provide a unique number that DxR could use to produce a key. A customer could call, fax, or contact DxR via the web to get the key to open the full working version.

Though the technology that Wright proposed was rather simple, it would require DxR hiring people to handle calls and provide support. But, Novartis' concern about Wright's informal suggestion was different. Many student customers used the software at both home and school. Novartis wanted to let them use it on multiple computers without a second license. Wright's suggested solution would only provide a license for one machine.

Myers also saw problems in exploiting the full advantage of the web:

*"Most of our products incorporate digital video, digit sound, and color graphics. They were designed to work best off CD. Under these circumstances, these products would not perform well over the web."*

Myers saw an additional problem. DxR had tried unsuccessfully to sell the continuing education software directly to individual doctors. DxR had lowered the price from \$100 to \$25. Unfortunately, a case was not like a reference book.

Once a doctor solved the problem it, it was no longer useful. Myers considered selling the individual cases online as a service, but encountered major technical problems. Most of DxR's software had been designed for a 640 by 480 screen size that, if accessed through a web browser, would require either a big monitor or scrolling windows in the browser. Further, many organizations were moving towards intranet delivery whereas DxR's programs were set up to be delivered from a server. Lastly, there were copyright issues. DxR and Novartis separately owned the various copyrights for different elements of their joint products: Novartis owned the Netter illustrations and DxR owned the software copyright, icons, and interface design.

Myers knew distributing DxR's products over the Internet presented many challenges. He wondered if the World Wide Web could be used to successfully distribute DxR's products. He also wondered if DxR could use the Internet in other ways.

Editor's Note: This case was received on September 1, 1999. It was with the authors for revision for approximately three months. The case was published on March 14, 2000.

## **APPENDIX A**

### **DXR PRODUCT LINE, 1998**

#### **INTERACTIVE PATIENT SIMULATION SOFTWARE**

This is high-level simulation, "problem-based learning" software. The Diagnostic Reasoning line facilitates teaching, learning and the evaluation of all key skills related to clinical problem solving. Fifty-eight real patient simulation cases are available that cover a broad range of therapeutic areas. This line has the most potential for multiple uses: academic practice and testing tool, learning tool, physical simulation game for physicians, customized cases for managed care, pharmaceutical marketing tool, and continuing education. The first case was developed in 1992 and additional cases are still being developed. The cases are available only as a site license. The simulation template was modified to

produce the Post-Clerkship Examination (PCX) for fourth year med students at SIU.

## **THE BOOK ON DISK**

The atlas series repackages existing content found in Novartis' atlas products. Educational features are provided in an interactive mode to use the book content more effectively. DxR has developed the following products in this line.

### **1. Interactive Atlas of Human Anatomy**

[Version 1.0, August 1996; Version 1.1, late 1996; Version 2.0,1998; Price: \$99.95]

This multimedia version of the leading anatomy atlas is flexible, interactive and easier to use with a visual search index, audio pronunciation of labels, electronic user's manual, 900 full-color illustration, detail magnification capabilities, and ability to view illustrations with or without labels. It may be used on Macintoshes or with Windows. Versions are available in English, German and Portuguese.

### **2. Interactive Atlas of Clinical Anatomy**

[Version 1.0 - July 1997; Version 2.0 – April 1998; Price: \$199.95]

This CD-ROM draws from all illustrations in Netter's Atlas of Human Anatomy, as well as illustration from the 12-book Netter Collection of Medical Illustrations. This product was nominated for the prestigious 1998 Codie Award for the Best Debut of the Year by the Software Publishers Association. It contains:

- Over 1,200 full-color Netter illustrations
- Nearly 2,000 compare screens of normal vs. clinical anatomy with
- explanatory text
- 1,800 cross sections from the Visible Human project
- 237 CT scans, MRIs and X-rays
- On-line help and tutorial movies

### **3. Interactive Atlas of the Central Nervous System**

Basic content and clinical material for a particular disease is brought together in multidimensional format in the NovaCon Disease Education Series. This series uses video, audio, text, animation and pictures to tell the story. For example, "peel away" layers of the coronary artery demonstrate its parts. And the viewer may watch the development of atherosclerotic plaque, as well as videos of the coronary artery during the angiography procedures. The CD-ROM has self test examinations and relatively simple navigation features. The Coronary Heart Disease module is the first in the series. A new disease module is scheduled to be completed every six months. The Congestive Heart Failure module was undertaken in the summer of 1998 and modules on hypertension, diabetes and irritable bowels are scheduled to follow. The Coronary Heart Disease module is priced at \$69.95 and the Congestive Heart Failure and Hypertension modules will sell for \$79.95 and \$89.95, respectively. The set of three is priced at \$195.00.

### **MISCELLANEOUS PRODUCTS**

This category includes customized products for the pharmaceutical divisions and products completed for third party groups such as the Infections Disease Control CD-ROM completed in May, 1998 for Northstar Hospital.

## **APPENDIX B**

### **ANATOMY OF A PROJECT: NORTHSTAR HOSPITAL**

#### **PROJECT INITIATION**

Northstar project involved developing a certification product for the continuing education of physicians in New York state. The product provided information about infectious disease control. DxR had worked on a project with one of the physicians at Northstar. He had been so pleased with the results of

that project that he referred DxR to a woman in charge of the New York certification program. In early 1998, the woman contacted Hurley Myers. To determine the price for the Northstar product, Myers came up with an estimate and then doubled it. The project was initiated when Northstar sent him a check for the first half of the price, which was essentially the original estimate.

The Northstar project was demanding because it was a three-month rush job and because everything had to be approved by a committee in New York. The committee members had many opinions about how the product should look and their opinions extended beyond content. Myers encouraged this because he believed that it increased ownership in the end product.

## **PROJECT DIRECTOR**

The hierarchy for Northstar, like all DxR projects is well defined. The project director made sure that the work was getting done and oversaw the work of the programmers. When necessary, the project director did technical work. Because of quick turnaround promised for the Northstar project, the programmers worked many long hours and weekends, and the project director pitched in to help.

## **ENTER THE GRAPHICS DESIGNER**

The first step of the project involved coming up with a look..... a concept. Rita Barber, the graphics designer, came up with various alternatives for the interface. She did a mockup for the Northstar project so that it would be easier for the clients to see what the product would be like. In this process she admitted that she received a lot of help.

Barber's office has a glass wall onto a main hallway. She noted: "*People have freedom here to come in and tell you what to do. We never design anything on our own. We have freedom to make suggestions. We never develop anything in isolation.*"

Barber continued: *"We start with something and then send out screen shots. We just drag people in here, or present ideas to the core group. Of course, Hurley has ideas and the client has ideas. And we get ideas from the people here."*

Four or five concepts were sent to Northstar. But the Northstar contact had a clear idea of what he wanted. He wanted a "Power Point look" with a bright blue background and gold buttons. Barber added, *"We were not at all happy with the interface they chose."* But the customer had the final say, and the product was developed in accordance with the wishes of the committee.

Barber was well into the development when a project director came in and told her: *"You should see the buttons on Windows. They are too dark."*

Barber was developing on a Macintosh computer because of its strong graphics capabilities. The Windows version does not have the opacity of the Macintosh, nor does it have as wide a range of colors. Barber can only use 16 base colors on the Windows version, and she noted that none of them are flesh-colored. Soft colors are available on the Macintosh. Barber can set the gamma version on her machines so they correspond to the Windows version. When she checked the Windows version as suggested, Barber found that the colors were too dark and she worked to lighten them. This required major changes to the palettes of basic colors used in the icons and backgrounds.

## **ENTER THE MULTIMEDIA TEXT EDITOR**

Muriel Rice, the multimedia text editor had been hired in November. Northstar was her second project at DxR. Like the other DxR personnel assigned to Northstar, she worked long hours and she worked five weekends in a row.

The majority of Rice's time was spent reading the text authors have written in the context of the graphics and technical navigation. She said, *"I tried to make sure everything fit together in a logical order. I made sure the flow was logical and intuitive. I also tested as I went along. I was not the primary person to do that, but since I was in there looking at the stuff already, it was reasonable for me*



*to do that. We all do that. Sometimes I needed to change the way things were written."*

## **FINISHING UP**

Patrick Forer and Tammy Fishback noted that testing is a major part of their job as Customer Service Representatives. They didn't have any specifications to let them know how the Northstar software was supposed to work. So when they had questions, they asked the product director, who couldn't always help them. In those cases, the product director checked with the programmer. As a result, the testing of the Northstar software was both hurried and pretty shotgun in its approach.

Barber did the last review before the Northstar software went out the door. She said, *"We had banding at the bottom. The other graphics designer and I were livid, but the others couldn't see it."* Since there was no time to get rid of the banding and still meet the deadline, the software was shipped.

A week later, Myers received a call from the woman at the hospital who initiated the project. She was very pleased and told Myers that she had mailed the second half of the payment. Myers informed Novartis of the payment, and the routine check sent by Novartis was subsequently reduced by the amount of the payment.

## **APPENDIX C**

### **A DAY IN THE LIFE OF A CUSTOMER SUPPORT PERSON AT DXR**

Note: This appendix is based on interviews of Patrick Forer and Tammy Fishback: May 1, 1998  
Tammy explains her view of the day of a DxR customer support representative:

*"There is no such thing as a typical day. We get 5-7 customer support calls a day that last on an average of 10 minutes each. In addition, our jobs include performing technical research needed to solve some of the more difficult problems; entering the data on the customer calls, communications, etc. in our database; producing reports; and assisting with technical problems around the office. This leaves some time to assist with projects to support the company. For instance, right now I am working on two databases: one to keep track of the software and related books we use to create our products, and a new customer support database from which we can more easily generate a variety of reports. Patrick and I are both part of a team which is analyzing our environment for a better solution to our company's daily backup routine and archiving system so that we can recover and find important data more consistently."*

*"We also pitch in as products are being developed whenever we have time. For instance, we spend time testing, using the software like a customer would, or systematically running through specific parts of the software which are likely to have problems. When we run across these "bugs," we document them on "bug sheets" which go to the project director for review and prioritization, then on to the programmer."*

*"I enjoy the variety of work, the fact that we are always learning something, and being part of a team who are internally motivated to do the best work they can do. On a personal note, not having to dress formally every day is a breath of fresh air for me!"*

Patrick Forer adds a lengthy list of support activities:

1. Setting up utilities and facilities
2. Running virus checking on a CD before it goes out.
3. Researching tools and techniques for development.
4. Maintaining and expanding the 10-Base-T corporate network.
5. Managing the file and mail servers.
6. Maintaining workstation hardware for most in-house users.

Patrick elaborates on one important customer support activity:

*"You would be surprised about how many calls we get asking about reusing the images. People want to argue with us about their rights to export Netter images as clipart. Craig says, "we are not selling clip art." Novartis says "NO" officially, but for the right customers, they will be flexible so we don't have a firm policy. We have been told to pass requests for using images on to Novartis."*

*"Requests come up several times a week. Novartis does have a permissions office (Barbara Berger) that decides if there will be a fee. The current image use request form is primarily for the Novartis Print Media (not our CD products) and needs to be modified to accommodate the electronic/multimedia age. They do have an electronic form for image use requests on the Novartis Med-Ed website."*

Testing is an important in-house function.

*"When we test, we don't have a specification to tell us how a product is supposed to work. So, we have to ask the product manager (director) who may not know either. He or she might then have to go check with the programmer. The Mac version is developed first, and serves as the standard. This lack of a target*

*specification can cause serious testing complications. It also makes testing interesting. We have pretty well heard there is not much of an interest in specifying the product in advance."*

*"We (support reps) have every interest in not having things shipped until everything is ready because we have help the customer deal with the problem. Testing is a good way to learn the product."*

One aspect of the job that Patrick finds particularly difficult is archiving important data and files. We have made feeble attempts to standardize our file storage and naming conventions, but this has never really succeeded.

*"File storage and naming conventions are up to each project director. As support people we are supposed to help them archive important data. Robert and Hurley want this to happen more reliably, but I don't think we will have any success in this until we re-dress the fundamental work flow processes."*

*" I worked at a software publishing house in Ann Arbor Michigan called CText Inc. CText produces software for the newspaper publishing industry. They maintained a library log of recent revisions. This only works very effectively on reasonable sized files. It scans the copies and looks for changes. But our files with bit mapped data are too big. We have much more complex software. Our manual process of putting stuff on servers and naming them intelligently has never succeeded because of the nature of multimedia development."*

*"Some of the workplace coordination complexities of multimedia development are:*

1. *Large file sizes strain disk space, backup tape and network bandwidth.*

2. *This large file size makes versionizing changes to code difficult as there are few tools on the market (like PVCS) which will handle large project files consisting of integrated graphic, text, and source code. Thus, tracking intermediate changes to code are difficult and time consuming.*

3. *In-process project development files are frequently stored on workstations instead of a centralized fileserver.*

4. *This complicates file back and file management (though we do use Retrospect to backup workstation hard drives nightly). We have lost work multiple times because we failed to identify files as important and failed to back them up.*

5. *Post project archiving of files is difficult, time consuming, and error prone. If project files were accumulated on the file server, identifying them and archiving them to CD would be easy.”*

## **APPENDIX D**

### **INTERVIEW WITH MURIEL RICE: EXPERIENCES OF A MULTIMEDIA TEXT EDITOR**

April 30, 1998 - I moved here from Boston last September--my husband got a teaching job. I am a writer. In college, I was the editor of an honors department literary journal. My degrees are in German and Anthropology. I edited, wrote, and translated educational medical manuals in my first job. In my most recent previous job, I also designed an interactive web site for a non-profit public policy research group. I was a German teacher in Germany before that. I moved here with only a few weeks notice, so I didn't know what kind of job market to expect. I ended up with an interview at this company only because someone had suggested that the incubator was supporting some very interesting

companies. The Director of the incubator was gracious enough to interview me and he immediately introduced me to Hurley, since he knew Hurley needed an editor and was working on a project in German.

Hurley was the first person whom I interviewed with here in Carbondale who said, *"Great! I'm so glad you came! You have skills and experience we could use here."* I liked that! I had had four other interviews that week where people said, *"What are you doing here? You haven't done this same job elsewhere, so we're not sure you could do it here."* It is sometimes difficult for people to fit me into a strict job description because of my varied work experience and my Humanities degrees. They don't always appreciate that studying the Humanities trains people to think critically, communicate clearly, and develop research skills. Hurley looks for people with those skills. Many of the people here have so-called nontraditional backgrounds and it works out very well. It's a creative, intelligent group.

Hurley asked me what I had done. He asked me to come back in with publications I had worked on. He asked me what I wanted to do, what my interests were. Hurley interviews everyone. I also talked with four or five people on the second trip. I took this job even though I could have made more money elsewhere. I took this job because it is exciting stuff and the staff looked cooperative and hard-working.

Hurley appreciates things being done well. He tells people they have done a good job - also tells them when he is displeased. He explains why it would be better to do it another way.

On my first day I noticed that people here had a very good sense of humor and four or five people came up and offered help. It was nice to feel so welcome. I knew I had to learn this software (Multimedia Director) really fast to keep up with them.

I thought that I better start taking medical books home to catch up. I had to write something about hormone levels or the effects of hormone levels. I thought, I am going to have to read 6 medical books to write those five paragraphs to

elucidate the five paragraph titles that I was given. I've learned a lot while working here.

The majority of my time is spent reading the text authors have written in the context of the graphics and technical navigation of the software. I try to make sure everything fits together in a logical order. I make sure information is presented in a way that a student at that level can get something out of it. I make sure that the information flow is logical and intuitive. There must be a fit between the text, graphics and logical flow. I also test the software functions as I go along. I am not the primary person to test, but since I am already looking at the products, it is reasonable for me to do it. We all do that.

I also try to negotiate between the authors and the software side so everyone's needs are met. Sometimes I need to change the way things are written. Most people who write text, they are used to working in paper. Sometimes changes need to be made to accommodate the medium. With print text, for example, you can use footnotes and relay supplemental information that way. It works differently for multimedia. - sometimes you convert a footnote to a 'hot' word (that's text you click on to get more text). Sometimes the note gets its own screen or a pull up window, or maybe it's best expressed as an image.

## **APPENDIX E**

### **CONTRACT**

Richard Klein, in collaboration with Hurley Myers, developed a contract which was signed in October of 1995 by Myers and the President of CibaGeigy. The contract outlined the relationship including day to day management issues, work arrangements with third parties, and the exchange of money. It guaranteed an annual income to cover DxR costs with no more than twenty-five employees. From six months before to just after the contract expiration on January 1, 1999, Novartis had the option to buy up to 70% stake in DxR. If they choose not to buy, Novartis was required to provide an early notification. Speaking in the early summer of 1998, Myers said:

*"Novartis' indications to us now seem to be that they are not going to buy us. That is our wish as well. We might be more secure if they did buy us, but they appear to now be focusing elsewhere."*

Richard Klein, who designed the three-year contract, explained the benefits of the relationship to DxR: Myers needed the financial security of those three years. *"I don't think he could have survived at the staff level he reached. He got both stability and security for those three years."*

Klein continued, *"He would develop a product and get a royalty on any sale. Half the royalties were his. The other half would buy down our liability for that period. We would give him say \$800,000, and if he were getting a royalty it would be less."*

More specifically, if DxR won a third party contract that was approved by Novartis, 50% would go to Novartis, 40% would go to buying down the Novartis contracted amount, and 10% would be allocated for profit sharing. On products developed with Novartis, DxR would have a right to a royalty on it.

But Klein also acknowledged the benefits of the contract to Novartis.

*"I wanted to tie Hurley down for a minimum of 3 years. I thought he was a pioneer in developing materials for the electronic platform. I wanted an honorable person. I wanted to have a supplier that I knew I could rely on."*

*"I took one look at the Atlas that my predecessor had developed and I said I would not market it as it was just a page turner on the computer. So I talked to Hurley about it and we agreed to develop a much more sophisticated scheme - it became one of the largest-selling CDs in medical education in that first year it was released. That product was a money maker."*



Myers assessed DxR's contribution to Novartis:

*"We bring two resources to the table. First, I am a front line educator who brings real medical education experience and I work closely on the projects. Second, we have a good team of developers."*

## APPENDIX F CASE TIMELINE

<b>Timeline of Major DxR events</b>	
<b>Date</b>	<b>Event</b>
Mid 1980s	Kevin Dorsey and Hurley Myers create initial simulations for medical students at SIU.
	Myers wins grants from Technological Commercialization Center (TCC) and Apple Computer to build simulations; Receives support from the SIU Medical School
Spring 1992	Support discontinued from SIU Medical School
July 1992	DxR Development Group, Inc. is incorporated by Myers, Benz and Dorsey and operations housed in incubator at SIU
Fall 1992	Patient Simulation Software released by DxR Group, Inc.
Fall 1992	Myers contacts Phil Flagler at CibaGeigy
Winter 1995	Phil Flagler takes early retirement and is replaced by Richard Klein
October 1995	Contract negotiated by Klein and Myers is signed by CibaGeigy and DxR Group; Myers buys out Dorsey's share of DxR Group.
Winter 1996	Richard Klein is replaced by Peter Carlin; Myers' new contact

<b>Timeline of Major DxR events</b>	
	is Carlin's direct report, Craig Yarwood.
April 1996	CibaGeigy merges with Sandoz to form Novartis
August 1996	Version 1.0 Interactive Atlas of Human Anatomy released
Late 1996	Version 1.1 Interactive Atlas of Human Anatomy released
Winter 1997	DxR Group bids unsuccessfully on Netter diagram digitization project
July 1997	Version 1.0 Interactive Atlas of Clinical Anatomy released
Winter 1998	Coronary Heart Module (NovaCon series) is released;
February 1998	Version 2.0 Interactive Atlas of Human Anatomy released
April 1998	Across the board cuts of 20% mandated at Novartis; cutbacks expect to impact DxR Group
April 1998	Version 2.0 Interactive Atlas of Clinical Anatomy released; Software Publishers Association nominated the product for the Codie Award "Best Debut of the Year."
May 1998	Northstar Project is completed.
Summer 1998	Congestive Heart Failure Module (NovaCon series) is released.
January 1, 1999	Contract with Novartis scheduled to end

## **ABOUT THE AUTHORS**

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Blake has been awarded the distinguished Marvin Bower Faculty Fellowship at Harvard Business School and the John Olin Fellowship at Templeton College, Oxford University. . Blake was also recently honored as one of the first Fellows of the Association for Information Systems and is President-Elect of that organization, as well as a member of its Senior Editorial Board

His scholarly contributions have been recognized by the Management Information Systems Quarterly, which named him as one of two recipients of its distinguished scholarship award. His eleven years on the MISQ board included three as Editor-in-Chief and three as Senior and Founding Editor of MISQ Discovery

He is founder and past Editor of ISWorld Net. He is also the founder and editor of the ISWorld Net's Electronic Commerce Course Page.

His long involvement with the International Conference on Information Systems (ICIS), includes being Co-Chair of both the 1994 Dallas meeting and the 2001 New Orleans meeting.

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