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ABSTRACT

A graphic arts equipment company is analyzed using multiple techniques to determine the company's best path forward to achieving the goals of increasing shareholder value. Michael Porter's Five Forces and Value Chain models are used to better understand the graphics arts equipment industry and the manner in which the graphic arts company currently brings value to its customers. The company is also examined to determine how well its structure fits with its stated general strategy. Finally, a ratio analysis is used to examine the financial health of the company.

The results of the multistage analysis are consolidated in an overview of all the challenges facing the company, and then recommendations are made to deals with the issues as well as to guide the company into the future.
DEDICATION

I would like to dedicate this thesis to my beloved wife, Verena. She has guided, encouraged, and supported me during this challenging process while undertaking even greater challenges of her own. This work is as much hers as it is my own, because without her I would not have made it through.
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1 INTRODUCTION

The prepress segment of the graphic arts industry has been entirely revolutionized in the last ten years. In 1995, Creo® introduced the world’s first thermal laser computer to plate (CTP) device to the industry at DRUPA, the printing industry’s largest and most important trade show. Suddenly, large tracks of technology in every print shop around the world were obsolete. Processes, software, equipment and people all needed to change or be eliminated by this new technology. These changes impacted the providers of prepress equipment dramatically. Entire product lines were irrelevant in the face of the new technological standard. As in any market, the competitors were quick to react, and the industry was flooded with a range of hardware, software and consumables. Creo imaging devices utilizing Kodak thermal plates were no longer the only option for CTP.

Since that time Creo has built a reputation for producing the highest quality hardware and software in the industry. This reputation for quality has served Creo well and has been a cornerstone of the company’s strategic position for many years. However, the past several years have been tumultuous for Creo. In 2000 it merged with its main competitor, Scitex, which drove a year of integration efforts and inward focus. While it was dealing with the organizational upheaval the company lost sight of providing value to the customer. The organizational difficulties of 2001 were followed by a general economic decline and, subsequently, the impact of September 11th, which continued to be felt into 2002. 2003 was a turnaround year for the company and saw stronger sales return it to profitability.

Now the company is at a crossroads. It has finally completed its full line of products by adding consumables, and is investigating how it can leverage its full capabilities into the profit and growth demanded by the shareholders. Creo must decide whether to stay in the market in which it currently operates, expand its reach in graphic arts, or branch out into entirely different markets to achieve these commitments. It must also decide how to reach its objectives within any of the market decisions it makes. Should it try to maintain its differentiated stance or should it shift to becoming the lowest cost prepress equipment provider? Additionally, the question of what Creo does after it moves beyond this immediate crossroads looms ahead. The company needs to be considering its options tens years into the future when it is planning for the next five.

This paper will examine these questions and the circumstances around them. It will attempt to capture the entire picture of Creo’s position and, after a thorough examination of Creo’s challenges, will make some clear actionable recommendations that Creo can use to meet
or exceed performance expectations. The first chapter describes the industry in which Creo operates in general as well as the major competitors within the industry. The second chapter provides a more detailed analysis of the prepress equipment industry using Michael Porter’s Five Competitive Factor Analysis model\(^1\), and gives an assessment of how easy or difficult it will be for Creo to be successful in the industry if it stays its current course. Chapter three provides a broad overview of the graphic arts equipment industry value chain as well as a detailed examination of how Creo provides value to its customers. This analysis is done using Porter’s Value Chain\(^2\) model and also describes some critical success factors necessary for any company to succeed in the prepress equipment industry. The fourth chapter takes a closer look at the most important issues preventing Creo from achieving all its goals right now. Once this picture has been painted, chapter five will close the paper by describing what Creo should do to address the issues presented in chapter four.

1.1 Graphic Arts Equipment

The equipment industry for the prepress segment of the graphic arts industry has changed in character not only due to the introduction of thermal imaging, but largely because of the expansion of information technologies into the printing industry. Printing is the process of putting information on paper for distribution, but the translation of this information from idea to ink used to require multiple physical transcription steps. Each of those steps could introduce errors into the intended output. Now, with CTP technology, the transcription can occur with many fewer physical steps, thereby improving the consistency, precision, and speed of the printing process as well as eliminating a significant amount of the cost of the equipment, processes and time.

Before CTP, printing plates were produced via photographic techniques. Film elements containing images and text would be re-imaged onto a single large piece of film. This large piece of film was then used to expose the printing plate and encode the information into its photosensitive polymer. Film separations were made for each color that was going to be used in the actual printing process. This multistage process required many hours and skilled craftspeople to align everything and ensure that the color and images would combine properly to form the

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desired image on the inked page. This process was partially simplified in the 1980’s with computer to film (CTF) technology, but the processes still contained many of the problems inherent in film. CTP simplified the production of plates immensely by eliminating an entire class of consumables and avoiding a multistage transfer process that moved the information from the photographic film media to the photographic plate media.

CTP products have a variety of attributes that provide value to the customer. Perhaps the most crucial specification for plate-making devices is throughput (the quantity of plates that can be produced in a given period of time). This specification is dependent on the efficiency of the plate handling functionality as well as the speed of actual imaging. Other major specifications concern automatic plate handling, with the goal being to maximize the amount of uninterrupted imaging time and to allow for unattended operation. Options such as a multi-cassette unit, a single cassette unit and manual load illustrate the range of products targeted at this functionality. Other important considerations are overall device size, or footprint: these devices can be quite large, taking up significant amounts of space in a print shop. Maximizing functionality while minimizing the footprint is necessary to provide a competitive offering. Finally, capabilities such as in-line punching of the plates (a feature to help the plates to be put on the press), and integration into a plate processing line are among the miscellaneous characteristics that round out the list of features a customer will want in a CTP device.

Since each imaging system is designed differently and each plate media operates on different chemical principles, it is necessary to do a significant amount of experimentation to understand how to best make a specific type of plate in a specific CTP device. To make the entire system operate properly laser parameters need to be adjusted; loading roller pressures need to be altered, and so on. The requirement to fine tune so many different aspects of the system indicates the still delicate nature of the plate making process and has spawned a secondary level of development activity in the industry. This development activity is called plate qualification by Creo and involves an exhaustive testing of a given type of media on a given device. Creo leads the industry in this type of development efforts for two reasons: first, because it was initially solely a CTP manufacturer, Creo was dependent on media vendors to provide a consumable that worked well in the Creo devices. Second, Creo was motivated to qualify as many types of plates as possible to increase competition in that market, drive thermal plate prices down and reduce any obstacle to the adoption of thermal CTP technology. This plate qualification development activity seems to occur with other CTP companies, but not to the extent with which it occurs at Creo. The plate qualification team sees almost every plate from every media vendor well before
it is commercialized. In a sense, Creo still helps the plate manufacturers design better thermal media so that Creo customers have the best customer support on the widest variety of media, but this may change now that the consumables landscape has been altered by the introduction of Creo plates.

The general value proposition the prepress equipment industry makes is that the products will streamline a printer's or prepress shop's operations and make it a more efficient, and therefore successful, business. If you listen to prepress managers issues, many of them have to do with software integration problems. Getting the new version of the Macintosh™ Operating System (OS) to communicate with talk to the latest version of Quark™ and other such activities seem to occupy much of their time. This indicates a need for data solutions that many companies are competing to satisfy - prepress equipment providers have evolved to meet this obvious need, and whole product lines have been built around software to facilitate the transcription of ideas to paper. As with any data system, the siren call of complete system integration is strong. Printers would like to see automatic quotes generated based on file structure, color, paper desired, delivery time, and other such important variables. This would in turn be tied to purchasing systems that automatically restock the supplies used, the scheduling system for optimizing press usage and a shipping request to deliver the product to the desired location. Other crucial information for the bindery and folding equipment would also be propagated through the system to allow end to end planning for the job. This kind of system integration is being sought by the Network Graphic Production (NGP) initiative, a group of industry-leading equipment and software providers that was originally started as a Creo initiative. Basically, the NGP initiative aims to make every print shop as efficient as Dell's logistics operations - an admirable goal that is likely not achievable, but the NGP group is focused on ensuring that the data standards in the printing industry and the software they provide are not the roadblock.

Introducing new technology into any process, including printing, requires removing obstacles and objections. The world's oldest manufacturing process, it is dominated by a vast history and sense of craft. Only the last couple of decades have provided the measurement and control technology to quantify and control the process in a more rigorous fashion. The pace of technological change has been significant in the graphic arts world, as it has been elsewhere, so much so that many more conservative printers have tended to resist the inevitable switch.

This resistance motivated many companies to provide secondary and tertiary types of equipment to overcome the very real concerns and objections of the print shops; scanners and proofers are examples of this. Scanners were developed to allow printers to migrate their huge
archives of files and images on film to a digital, or soft, format. The scanners allowed prior film-based work to be reintegrated into the new plate production process. While CTP made previous plate production equipment obsolete, the years of work and valuable image files were not useless. This bridging technology was and is crucial to the continued adoption of CTP over older film-based production workflows.

Proofers have always been an important part of the graphic arts production flow. Press time is expensive and the printer wants assurances the customer will accept the job before it goes to press. Also, the customers want to know what is going to come off the press before the job is run. If a mistake slips through, they are without the product they want and potentially get stuck in ugly discussions about who is at fault for the mistake and who is going to incur the cost of the faulty print run. Proofs avoid this by showing what the print run is supposed to look like before it is done on press. They prove that the job is being done correctly. Proofing is done in a variety of ways: some is done virtually, on a video screen, but most is done with ink jet technologies or even multilayer thermal laser imaging. In the early days of thermal CTP there was concern about whether the way thermal imaging was performed would introduce new types of image artifacts or flaws. Several companies worked hard to incorporate thermal laser proofing functionality into their devices, so they could show that press jobs made with thermal CTP would come out exactly as they appeared on the thermal CTP proof. Again, a bridging technology was necessary to overcome industry caution with respect to the adoption of new technology.

To understand the value proposition of workflow software to a printer, consider the example of publishing a typical glossy color magazine. Organizing and simplifying the process of putting together hundreds of pages of four color file separations into a single magazine is a tremendous file management task. This is multiplied in complexity even more if you consider that each page might contain numerous multi-color advertisements which consist of a separate set of files. When processed (Raster Image Processed, or RIPed) into a format necessary for offset printing each of these files becomes quite large, necessitating huge file storage capabilities as well as compression and decompression functionality. So the prepress manager has to juggle hundreds of these large files and ensure the right ones are imaged onto the right plate with the right orientation, etc. This is crucial, because with modern post-printing equipment the pages are folded, cut and bound as they come off the press, so a mistake will be propagated all the way to the final product. Good workflow software facilitates this complex coordination process and can even provide some business logic evaluation if the files contain the appropriate meta-data.
File sharing applications are another example of technology being used to remove roadblocks to adoption for the software portion of the industry. Graphic arts files are very large, especially when sent in an appreciable quantity (as they would be for a book or magazine). Creo has demonstrated a new application which facilitates the swapping of files via email systems without exceeding the capabilities of a standard mail system. This application, Tokens™3, aims to reduce the roadblocks to an all digital creative workflow process, and it enables a much easier exchange of graphic arts files between client and vendor.

Plates for the printing presses, or consumables (in the prepress nomenclature), are the third main segment of the prepress equipment industry as well as the lifeblood of the printers. It is the area where most of Creo’s competitors made their start, and is attractive because of the continuous revenue stream a consumables business model provides. The important business criteria for this product category are very different from the others: logistics reliability is crucial, and plate coating consistency is essential. The particular quality of a given plate and vendor is difficult to separate from these two main factors.

The products and services available to the printing industry are impressive in their diversity and technological sophistication. Cutting edge laser systems, networking software, polymer chemistry and mechanical systems are all combined to simply put ink on paper more quickly and accurately than ever before.

1.1.1 Consumables

Printing plates are the newest product in Creo’s product line. These plates consist of an aluminium plate coated with a special photo-sensitive polymer. Areas of the plate are made hydrophobic or hydrophilic by the laser in the CTP and therefore hold or repel ink appropriately to put the ink onto paper via an offset press. After being imaged and processed these plates are mounted on an offset printing press, where the proper ink and water balance is established to put ink only on the precise locations it is desired. If the tiny dots of ink are misplaced, many print problems, artifacts, result. Offset printing requires the delicate balance of water and ink to permit the fidelity of imaging that is capable with these systems. Without the water, the ink features would grow and smear when pressed onto the paper and poor print quality would result. The chemical properties of the printing plates are very specialized to create this delicate balance and provide good print.

3 Creo Inc. Products, Creative, Creo Tokens [online]: see http://www.creo.com/global/products/software_solutions/creative/tokens/default.htm
Many existing players in the printing industry began as consumables providers. Agfa, Kodak and Fuji have all thrived as the major providers of film and plates to the printing industry. When Creo introduced thermal CTP to the industry, it was providing a platform from which these companies could develop a plate product with many advantages over the existing UV film based plates and processes. As the first provider of CTP devices Creo was able to charge high prices for its CTP devices. The plate providers all saw how Creo was profiting on the device sales so quickly followed suit, while still maintaining a media development relationship with Creo. Plate qualification was a free service Creo provided to media vendors to help them bring a wider variety of thermal media to the market more quickly. The aim of this was to drive thermal media prices down and therefore increase the adoption rate of thermal CTP technology. The plate qualification services involve many different kinds of tests on Creo equipment to see if the media is suitable for use. Some of the tests involve basic handling characteristics to determine if the media is scratch resistant, and others involve laser imaging while varying a number of parameters to find the optimal laser settings for the media. The sensitivity of a media and therefore its potential throughput in a specific device is determined during this process and is a very important test with respect to the market positioning and potential success of that specific media product.

It was through these media qualification efforts that Creo became aware of the plate manufacturing company that Creo recently acquired. The company was called Spectratech and it had a nice, modern plate manufacturing facility in West Virginia, as well as a very good negative working plate. The acquisition increased Creo’s media manufacturing capacity significantly and rounded out the product offerings Creo provides with that negative working plate targeted at the commercial offset market as well as a negative plate aimed at the newspaper printing market. Initially, Creo had only subcontracted for plate manufacturing capacity at a plant in Europe. Creo provided the chemical formulation and the media manufacturer did the coating of that formulation as well as the rest of the manufacturing and logistics operations for the product. The product is even branded under that manufacturer’s brand name, Ipagsa, and Creo is officially bundling with a third party plate manufacturer in deals where Ipagsa plates are being considered. Creo eventually found the plant in South Africa now known as Creo South Africa, where that formulation, a positive working formulation, is coated onto plates under the Creo brand name, Creo PTP (positive thermal plate). This sequence of steps has enabled Creo to build a significant presence in the graphic arts consumables arena, and Creo intends to leverage this to its maximum benefit. Creo used to be an equipment company that also wanted to sell media, but reality is now
the opposite. The company is now a media organization that just happens to have a longer history in equipment. It will not be long before consumables makes up the majority of Creo’s revenue stream. The day this is true is the day that Creo will have stabilized its future and eliminated its most significant weakness.

1.2 History and Culture

Creo was founded in 1983 by Dan Gelbart and Ken Spencer⁴. Both had worked together at a Vancouver, BC technology company called MacDonald Dettwiler Associates and ventured off to set up their own company together. Creo’s first product was called the Optical Tape Recorder (OTR). It was an extremely high capacity optical tape drive and a mechanical, electrical and optical marvel. This first venture was a technical success, but a major marketing failure and only a very few of these machines were ever sold. However, the company leveraged the technical expertise it gained from the OTR project as well as some other engineering efforts it had made for the printing industry, and in 1990 shifted its focus to providing full solution CTP products to the graphic arts market.

After shifting its attention to graphic arts, Creo spent the next 5 years bringing thermal CTP to the market. As a step in that direction, Creo produced a visible light CTP in 1994. At DRUPA ’95 Creo introduced thermal CTP and established itself as a major player in the CTP industry as demonstrated by an already significant install base of its visible light systems.

Creo chose thermal technology coupled to an external drum imaging engine as it was a robust, versatile architecture that allowed Creo to leverage its basic technology in a variety of applications. Proofing, film imaging, plate imaging, process-less media could all be done on one device platform. The basic concept was also applied to on press imaging, where imaging lasers were incorporated into presses to avoid having to move the plates from the CTP device to the press.

Creo next turned its attention to providing a workflow management software tool, and partnered with Heidelberg to create Prinergy™, an industry leading product that digitized and archived files, provided reliable proofing capabilities, and excellent file management functionality. Shortly after Prinergy was released, in August of 1999, the company went public. This was a huge moment for Creo as it is for any company. Many of the long time employees became reasonably wealthy and the company gained some needed capital to enhance its ability to

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grow. Creo in 1999 was hiring madly to keep up with all the initiatives and financial restraint was not common. People weren’t wasting money, they just were buying things they needed with very little thought about controlling expenditures or finding other ways to meet their needs.

Then, in February of 2000 Creo acquired the prepress assets of the Scitex Corporation. The prepress division of Scitex had been one of Creo’s main competitors, but the management of the two rivals thought they would do better together than if they fought against each other. The acquisition was presented as a merger by the senior leadership in an attempt to smooth the psychological transition for the employees. Their greatest rivals were now their co-workers. A lot of energy and effort went into the integration of the work forces, with only limited success, as well as the forced integration of the perceived product strengths of each original company’s CTP offering. A Creo laser was put into a device with Scitex automated plate loading. The merged company operated under the name CreoScitex, again in an effort to sell the merger idea, for almost two years, but the name and re-branding was found to be confusing to the market so the combined name was retired in January of 2002. The company went back to being called simply Creo with an updated logo and new brand standards.

The two years of CreoScitex were quite tumultuous. Each group felt fairly optimistic at the beginning of the process, but once the real work of the merger started to happen, the situation became difficult. Product strategies were not compatible, processes were not compatible, and philosophies were not compatible. The functional infrastructure of the company was strained at every point. Even major decisions about ERP systems were a victim of the internal discord. People went back and forth between Oracle and SAP more than once before finally settling on SAP, wasting precious time and money in the process. Leadership in several of the regional Distribution Units (DU’s, now Customer Service Centers, CSC’s) was replaced after conflicts over the increased attention they received from Vancouver. Large parts of the company were lost and adrift for a significant period.

The company finally got back on track after the re-branding. It was a symbolic gesture that actually had some resonance with the employees. Times were difficult after September 11, 2001, but the real integration had begun and real progress was apparent. Strategies and tactics started making sense again. Sales were poor, cost-cutting exercises were necessary, and morale wasn’t spectacular, but Creo weathered the economic downturn better than most of the graphic arts industry. Now, momentum is building for Creo. Revenue is up and some major projects are coming to fruition. The company weathered the last several years, and is beginning to learn some of the discipline necessary to succeed as a global public company. However, the next
major challenge ahead of Creo is not a roadblock that can be avoided. It is facing a saturated market, and will be required to transform itself into something appropriate for another market or industry in order to live up to the expectations of its shareholders and the market.

One of the long-touted hallmarks of Creo has been its culture. The unique "way of things" at the company is considered a major contributor to the innovation and success of the company. The uniqueness was embodied in two major concepts and supported by some less unique but equally as important philosophies. Creo characterized itself as a company with a flat organizational structure, where everyone was completely responsible for their own activities and where a decision required consensus among all the stakeholders. This is a very egalitarian way to structure a company, but it has several key benefits. The flat organization concept couples well with the individual responsibility, or Unit Presidency, concept. Everyone is equally responsible for their individual activities and therefore there is little need for a hierarchy of responsibility. The benefit of this philosophy is that it empowers every individual to look for better ways of doing their job, hopefully making the company more efficient and profitable. The lack of distance and hierarchy between the company leadership and a specific employee also allows for feedback and innovative ideas to come from anywhere within the organization. This should leverage the collective intelligence and talent of the employees much more effectively. The Consensus Decision-making philosophy follows almost necessarily from the Unit Presidency concept. If an individual is responsible for their area of activity, then he or she should be involved in any decision that might impact him or her. Additionally, several studies have been done on the efficacy of decisions made in a consensus style versus a more authoritarian style. While it was found that the consensus process took longer, it more often produces a better result in terms of the basic idea, as well as the smoothness of the decision implementation. Creoites adhere to this philosophy, but there is scepticism from some people newer to the organization.

A crucial element in building a flat organization based on consensus decision making is providing the most objective criteria by which to evaluate decisions. Otherwise, experience, ego, or personality can more easily overwhelm the process, with less ideal results. To this end, Creo has gone a long way towards instilling the idea of Economic Thinking. Decisions are made by evaluating the cost and return of each option. The basics of financial evaluation are demonstrated to every new Creoite, and net present value calculations are made routinely during the decision making process. Obviously, economic models are only as good as the person who created it. Economic thinking in isolation may not be that beneficial, but combining economic thinking with consensus decision making creates a strong process on which to build a company.
One curious impact of Creo going public has been the tension of balancing of the short
term financial goals of the market and Creo analysts with the longer terms goals of the company.
Prior to going public, Creo had “patient money”, now that the stock markets are involved,
decisions must be justified on a quarterly basis. This definitely has benefited the company, but it
also sometimes causes the company to make a different decision than it might have. The basic
techniques of financial analysis taught to Creoites also do not detail how to balance the quarterly
requirements against the longer term benefit. This takes some of the clarity out of the strong
decision making process Creo has, and shifted the final word higher in the company. This
phenomena erodes the flat organizational concept slightly, but the long term impact of these
changes, if any, have yet to be fully felt. Much of Creo’s decision making still occurs in the
same manner as it ever has.

Another important process for maintaining the flat organization concept has been the
peer review process. This process is described in greater detail in Section 2.2.3.2, but in essence
is a performance review process where anyone is free to provide feedback to anyone else if he or
she judges he or she has enough visibility to provide valid and constructive feedback on the
reviewee’s performance. This ability to influence someone’s performance review distributes
compensation power more broadly as compensation at Creo is partly performance based, again
flattening the organization. The process does have a good set of checks and balances, although
they are somewhat chaotic. Review consolidation meetings have something of the flavour of
Question Period in Parliament and are in keeping with the generally more egalitarian approach to
management at Creo.

Additional useful insight into Creo’s culture can be gained through the study and
understanding of the Principle Engineer position. This role came about as a way to recognize
sustained high performance in a technical domain and to provide a technical career ladder for
individuals to allow for growth while remaining technically focused. Too many good technical
people would switch to management positions because they felt they could not grow any longer
staying a design engineer. After switching, they might not succeed or they would lose their
technical edge. Both of these results were a detriment to both the individual and Creo. Dan
Gelbart and Ken Spencer created the position and selected the original individuals. Eventually,
when the group became large enough, they began to nominate individuals based on reputation
and performance ranking history. Then, supporting information from people at all levels around
the nominee was acquired and the existing principle engineers would come to consensus on
whether the nominee should become a principle engineer. Besides the criteria mentioned above,
other things like mentorship and “caring about the company” were used to decide on the appointment of an individual. This role, while not unique by itself, helps underscore the value that engineering acumen is given at Creo. Actively creating a position that has a say in most of the levels of decision making at Creo and is based solely on engineering performance shows an incredible faith in and reliance on engineering intelligence. Engineering innovation is the stuff of which Creo is made.

1.3 Current Strategic Position

Creo is currently considered among the leading prepress equipment providers in terms of quality, innovation and price. It has focused on the higher volume printers of the world, establishing a strong presence with printers above $5 million in annual revenue. These are printers that require the best equipment to deliver on commitments to huge customers. The printers in this market segment are the true manufacturers of the printing world, the ones for whom craft has less and less of a place in the print shop. Creo’s marketing message and value proposition of process control and stability is very compelling in this market segment.

Unfortunately, the size of this market in terms of number of customers is significantly smaller than the rest of the graphic arts world. The larger printer market is very close to saturation, and the equipment replacement cycle is too long to support sustained profitability and growth for even one company, much less the ten or so major CTP providers. Even if Creo was alone in the market, the large printer market would eventually not allow for the growth demanded by the shareholders. Creo’s current strategic position will not support growth much beyond the not too distant goal of 2007. Chapter three will examine Creo’s current stance in more detail to aid in understanding what the company needs to do to succeed into the future.

1.4 Competitors

Creo faces an array of strong competitors in the prepress equipment industry. The competitors come from a variety of different starting points in the graphic arts industry, but all are strong brands with recognized names and an impressive business presence. While Creo has a very strong lead in hardware market share, in terms of the entire industry it could definitely be characterized as David against multiple Goliath’s.
1.4.1 Agfa

Agfa, which originated in Germany, but is now headquartered in Belgium, has been involved in graphic arts for over 100 years. Over its long history Agfa has acquired many other companies, enhancing its technological capability and market presence. Currently it is one of the strongest companies in the graphic arts market, based mostly on its consumables business. Agfa also has CTP devices and software offerings, but in the graphic arts industry it is predominantly a consumables company that sells equipment rather than an equipment company that also offers consumables.

Agfa started in Europe, and its history in the region combined with a solid product line has enabled it to establish a major presence. Agfa also has a strong presence in North America within the Newspaper equipment market; however, it is not nearly as established in the traditional commercial print market in other regions of the world.

Agfa also is known to have an excellent marketing department. Its product development is not particularly strong, but it is good at creating a convincing story as well as attacking competing value propositions. The comparative lack of innovation does put it in the position of always following, but it has learned to take advantage of whatever second-mover advantage it can find. This was illustrated by Agfa following Creo in pushing thermal technology rather than promoting its traditional area of product strength, violet technology. Agfa also has imitated other Creo initiatives such as a copycat Network Graphics Production message.

1.4.2 Dainippon Screen (DS)

Dainippon Screen (also known as Screen) has a completely different approach to the graphic arts industry. Screen presents itself as an equipment company that serves a variety of industries. It was founded as a manufacturer of equipment for photo-reproduction in 1943 and now has a presence in many of the information display industries. Specifically, Screen serves the PCB industry, the FPD industry, the CRT industry, the semiconductor industry, as well as the graphic arts. The company is made up of a variety of industry-focused regional and functional subsidiaries. For example, the graphic arts sales organization in the US is Screen USA, but the service organization in the US is Dainippon Screen Engineering America (DSEA).

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Screen is definitely the strongest competitor in terms of equipment engineering. Its products are well designed, reliable and push performance limits. Recently, it has even eroded some of the imaging technology difference with a new laser head that tries to mimic the Creo laser head. Agfa also tried to do this, but reports from the field indicate that the Screen head is superior and that Agfa may be abandoning the technology.

Early in its existence Creo performed contract engineering for Screen, and gained its expertise in engine technology through these contracts. These ties were severed once Creo began to focus on the graphic arts market, although there is the occasional refurbishment job that still finds its way back to Vancouver.

Screen's current strategy seems to be to provide high quality equipment through as many channels as possible. It has aligned itself with a variety of the other competitors in this list in order to provide device/consumable bundles to the printers. Even companies with a partial equipment focus (such as Heidelberg) sometimes resell Screen equipment. Screen sells their equipment through direct and indirect channels simultaneously, sometimes even in the same region. Recently, it came out that a lone Creo sales representative was competing against 63 other sales people pushing Screen offerings in one state in the US. Screen’s multi-distribution model, where different channels end up competing, raises questions about long-term sustainability. This seems somewhat at odds with conventional wisdom about how to optimize the distribution of one’s product, but DS’ pervasive presence may have some benefit.

The equipment only model of business did not work for Creo, and it is not clear it is a viable long term strategy for Screen, but it is having some success. A key area to understand is how DS can maintain credibility as an equipment provider without as much of the media qualification efforts that Creo makes. This may be a second-mover advantage, where Creo incurs the cost of qualification, working with the media vendor prior to the consumable being released, and then Screen also supports that media, basing their support on the assumption that Creo enabled the media vendor to develop a plate that was of sufficient quality for the industry.

1.4.3 **Kodak Polychrome Graphics (KPG)**

KPG (also known as Kodak) is without doubt the strongest consumables provider in the North American graphic arts market. It has tremendous brand presence, research and development (R&D) capability, and manufacturing and distribution capacity on this continent.

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Its name is synonymous with high quality printed material both in the commercial and consumer market segments. It was the first company to offer a Thermal plate to the graphic arts market. Kodak and Creo worked very closely together to bring Thermal technology from the lab to the market - Creo, to this day, uses Kodak plates to judge the quality of the imaging heads. This is something of a back handed compliment though, as Creo uses it largely because it is the most difficult media to image reliably.

While Creo and Kodak used to work very closely together, the relationship has soured as Creo has grown. It is as if Kodak wanted Creo to stay the small premium equipment-only vendor that provided Kodak with a bundling option and did not have any further ambitions. A series of clashes have occurred over the years, so there is no love lost between the companies, and this is especially true since Creo embarked on its own consumables strategy. Suddenly, Kodak faces another competitor that actually has a significant amount of credibility, and a competitor that knows Kodak’s product as well as, if not better, than Kodak does itself.

In the face of this strained relationship, Creo is being forced to re-evaluate its plate qualification strategy in the face off less amenable media vendors. The development activities are costly and media vendors are choosing not to follow the recommendations of Creo in the face of their market interests. Recently KPG has decided to sell a new plate that is not qualified with an older Creo laser technology. The image quality of the media was not stable across the full range of manufacturing tolerances of the older laser. Despite this lack of qualification KPG is going into sites that are still using this older technology and seeing if it works. By doing this, KPG is trying to force Creo to accept the expense of a costly upgrade to newer laser technology. It is ignoring the clearly stated qualification and spinning the situation as if Creo has sloppy manufacturing that is causing the media not work.

The strength of Kodak shows itself in its sales and distribution organizations. It maintains close ties with and tabs on its customers, and it is sure to provide its customers with plates on time. It also possesses competent consumables R&D capabilities, which have enabled KPG to introduce a very competitive plate to the market (Sword Excel™); helping it regain some of the leadership footing it has been losing in the last few years. Finally, Kodak has exceptionally deep financial resources. These resources are a strategic concern for Creo because they provide Kodak with a wider array of possible options with which to attack Creo’s position in the market. Rumours have even been circulating that Kodak is going to acquire Creo while Creo’s stock price is low.
Kodak has recently allied itself with Dainippon Screen to provide device and consumables bundles. This is a potent combination of strengths that is a significant concern to Creo, especially because each of that team has more pervasive distribution in North America than Creo. Combined they have exceptional regional coverage.

Another area in which Kodak poses a concern is its use of intellectual property (IP). It has written and filed a number of imaging system patents which have the potential to create obstacles for Creo. One patent even details the inner workings of a Creo laser head, which causes Creo to suspect that some reverse engineering was attempted. Creo has never openly acknowledged the patents nor has Kodak successfully introduced an imaging head based on the patent, but it illustrates the company’s strategic approach to the use of IP.

1.4.4 Heidelberger Druckmaschinen AG (HDM)

HDM (also Heidelberg) is the giant monolith of the graphic arts industry. For 150 years it has built a dominant position as the leading equipment provider in the graphic arts industry worldwide. Its success is largely based on continued innovation as a press manufacturer. Arguably, it is the best in the world. HDM’s real growth occurred in the middle portion of the 20th century, driven by several generations of innovative press designs. This growth created a leading position in the graphic arts world because of the prime importance of the press in the printing process. These factors have allowed HDM to acquire a huge install base of customers, over 200,000 worldwide, as well as build significant credibility within the industry.

However, for the last several decades HDM has appeared to slow down. It is still a prodigious company in the industry, with the largest presence at every trade show, but the pace of innovation has slowed significantly. Perhaps it is because offset press technology has reached its limits, but HDM does not have the impact on the industry it once had. The 1970’s saw the perfecting of the presses it offers, but the ’80’s were relatively quiet and the ’90’s more preoccupied with acquisitions than product innovation.

HDM tried to latch on to the digitization of the printing process that was accelerated by the introduction of CTP technology in the mid ’90’s but its attempts were more haphazard. Its major successes occurred via partnerships and joint ventures (JVs) with companies like Creo. HDM and Creo entered into a JV to manufacture and distribute the Creo Trendsetter, and to distribute the Creo PDF workflow software offering, Prinergy. HDM had the rights to sell in

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Europe and Creo was given the rights in North America. The products were co-branded, but the innovation due to Creo's product development efforts. This JV was dissolved shortly after the merger of Creo with Scitex, although HDM did maintain the right to service the customers to whom it had sold the JV products.

The JV was structured as it was to allow HDM to maintain the marketing strategy it developed over the years, best described by the phrase, “One Face to the Customer.” HDM wants to have complete control of the customer relationship and provide all HDM branded products to them. It wants to be the single provider of equipment, software and consumables to all its customers. This is something that many companies desire, but HDM seems to allows this to influence how it structures its business partnerships, arguably more than it should.

1.4.5 Fuji

Fuji is truly an imposing competitor. It is a gargantuan company, with 128 worldwide subsidiaries and almost $21 Billion USD in revenue for the fiscal year ending in March 2003. It also possesses an incredible array of technical competence, with R&D capabilities in chemistry, optics, software, materials, electronics, and other technical areas. This enables it to develop and offer highly competitive products to the graphic arts market. Its consumables products are considered among the best in the world and it is in that product arena that it is most feared within the graphic arts industry.

Fuji started as a photographic film production company in 1934 in Japan. It grew and expanded its manufacturing capabilities within Japan for the next several decades and then started to expand worldwide in the 1960's by opening an American subsidiary. Over the next couple of decades it continued its expansion into Europe and Asia, and its recent focus has been towards the burgeoning economy of China. During these decades Fuji steadily acquired technical competence in a variety of fields. Now it is positioned within many different industries as a provider of “Imaging and Information” systems.

Fuji divides its market space into three main areas: Imaging Solutions, Information Solutions, and Document Solutions. The graphic arts industry falls under the Information Solutions umbrella and makes up slightly less than one-third of Fuji’s total revenue for the

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This division is also occupied by the medical imaging and information systems, LCD materials, and recording media industries. This broad array of technology and industry access is part of Fuji's strength, but within the graphic arts segment only, it is perhaps a weakness. Fuji has many other issues to attend to in industries that are potentially more profitable than graphic arts, so perhaps the growth of one relatively small competitor does not overly concern it.

Fuji is the undisputed leader among consumables providers in Japan. Its origins, history, technical capability, and quality control make it very difficult to attack on its home soil. In other regions it is much less established, but is gaining a reputation as a quality provider. It seems to be more focused on North America and China rather than Europe, even though the European market for printing equipment is now considered larger than the North American market. This may be due to infrastructure and established presence rather than any other business reason.

In terms of hardware, the Fuji devices are solid performers, but do not stand out as exceptional when compared to the offerings from Creo or Dainippon Screen. Fuji's offerings in the screening and software arenas are again serviceable, but not particularly innovative.

All in all, the major threat from Fuji is derived from its strength as a consumables provider and the incredibly deep pockets its diverse industry portfolio provides. If the graphic arts industry warranted more attention, Fuji might bring significantly more resources and innovation to bear, but its lack of focus leaves room to maneuver in the industry. Fuji is very patient in its approach - it does not need to be first to market, but is content to go into a competitor's install base and steal it away with a better product at a better price. Fuji's technical expertise, combined with their manufacturing rigor and experiences, makes them able to provide one of the highest quality products at one of the lowest prices and still remain profitable.

1.4.6 Electronics For Imaging (EFI)

Another significant competitor for Creo is EFI. It is a company that does not compete in Creo's traditional market of prepress hardware or in the consumables portion of the market, but it has a strong presence in the software segment of the graphic arts industry. It also has the stated intention of expanding its presence in the graphic arts market. Creo and EFI have come into direct contention over control of the PrintCafe company. Creo was trying to recover some of

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the product assets out of a bad investment, but PrintCafe management scuttled the attempt with a poison pill and arranged to be acquired by EFI. Subsequently, many rumors circulated that EFI, with its tremendous cash reserves, was also going to acquire Creo and therefore gain entrance into the equipment portion of the graphic arts industry.

Creo and EFI also compete directly in the original equipment manufacture (OEM) software market for large digital printing equipment. Digital printing consists of large scale photocopying devices, where the information comes directly from a file rather than a scanned image of a hardcopy. EFI’s Fiery® servers are an industry leading software product that is being attacked by Creo’s Print On Demand Systems (POS) line. Creo has improved its relationship with Xerox® and captured market share over the last couple of years, and EFI is presumably worried about any continued growth.

EFI is a relatively young company, founded in the late 1980s, and its initial product offering consisted only of the Fiery server. Over the years, through growth and acquisitions, EFI has broadened its product suite to serve almost every aspect of the graphic arts market with the exception of those products more related to offset printing workflow management. EFI cornered the digital printing software market and is the leader in that portion of the industry. A public company, it is well capitalized and in healthy financial shape with little debt. Arguably, it has too much cash that is not being utilized effectively, and also has a very low debt-to-equity ratio that some analysts would consider too conservative. EFI should be further expanding shareholder value by using the cash and credit to fund additional growth.

1.5 Summary

The graphic arts market is a diverse and competitive industry in which to operate. The digitization of many of the print production processes has proven to be a lucrative opportunity for many players in the industry. Creo is poised to capture much of this opportunity, but one must question whether the industry overall is too restrictive to provide long term opportunities to the company and its shareholders. This chapter has described the general products offered as well as the major competitors who develop and produce those products. The next will examine the graphic arts industry and Creo in significantly more detail to understand how to make the company continue to prosper into the future.

This chapter contains a detailed analysis of the prepress industry and the value chain for prepress equipment. This analysis will provide insight into the crucial issues that face any company operating in the equipment portion of the graphic arts market, as well as deconstruct the functions that Creo employs to effectively serve that market.

2.1 Industry Analysis

As described before, introduction of digital technology has changed the graphic arts industry tremendously in the past decade. The impacts of these changes are still being felt as each competitor matures in applying these new technologies. The ripples have yet to propagate fully through every level of the industry, as smaller shops are still using outdated technology. A somewhat exaggerated analogy might be: a small textile manufacturer using a hand loom rather than an automated one. To take advantage of this flux companies have employed a variety of different product strategies, varying them across geographies, market segments and every other variable one could think of using as a way to partition the market. To get a meaningful understanding of the characteristics of the industry, one must step back a bit and apply some basic principles to understand the competitive landscape in the industry.

2.1.1 Five Forces Analysis of the Competitive Landscape

Michael Porter’s Five Forces That Shape Competitive Strategy provides a good framework to understand the dynamics of the prepress equipment industry. This chapter will use Porter’s Five Forces model to assess the intensity and quality of the competitive landscape in this industry.

Porter’s Five Factors are the following:

1. The Threat of Entry
2. The Bargaining Power of Suppliers
3. Rivalry amongst Existing Competitors
4. The Bargaining Power of Customers
5. The Threat of Substitute Products/Services

Each of these forces will be evaluated from a number of angles to illustrate how they impact the industry as a whole. See the overview chart displaying the industry characteristics in Figure 1.
Graphic Arts, Prepress Equipment Industry 2004

Threat of Entry
Low
(-) Laser imaging equipment is a large and complex system
(-) Printing plate manufacture and development is a huge undertaking
(-) Strong likelihood of retaliation to entrants, from entrenched players with very deep pockets
(-) Bundling solutions to compete effectively during sales cycle requires full compliment of development competencies
(-) Brand loyalty to traditional prepress providers
> Printers are very conservative buyers in a low margin industry
(-) The printing industry is very old and still run on a lot of tribal knowledge
> therefore very hard to ascertain industry needs/best-practices
(+) SW products are more easily attacked

Bargaining Power of Suppliers
Moderate to High
(+) Labor - good quality sales and service people are expensive to train and difficult to retain
(+) High quality optical components difficult to source
(-) Machine shops and board fabrication are relatively easily sourced
(+) Graphic Arts are a small user of key components compared to other industries (cell phones, military, etc.)

Bargaining Power of Customers
Low to Moderate
(-) Competitive Concentration is high
(+) Industry growth is flat with a focus on mix share
(+) High fixed costs
(+4) Long term media supply contracts allow intense discounting of equipment
(+4) Complex products allow for confusing "spec-manship" between competitors' products
(+4) Customers incur high switching costs to learn how to use a competing product

Rivalry Among Existing Competitors
High
(-) Despite the promise of paper reduction, paper still provides best contrast for display of information
(-) New marketing methods utilize additional personalized print material
(-) CTP has drastically improved the quality available from offset print achieving photographic quality
(-) Flexible display technology has the characteristics to replace a significant amount of paper, but advertising will likely be able to be avoided, therefore necessitating print technology
(+4) Inkjet still has significant technological hurdles to overcome before becoming as cost effective as offset printing, but is gaining slowly
(-) Digital printing (photocopying) is not yet near commercial quality or cost for longer print runs
(+4) Other laser technologies do not provide as many quality/process control benefits, but are less expensive

Threat of Substitute Products/Services
Moderate
(+4) Buyer concentration among highly profitable Strategic Accounts
(+4) Increasingly complex product offerings
(+4) Excellent bundling opportunities between machines, SW, and plates
(-) Industry is segmented into different market areas with very different needs

Figure 1 - Five Forces Analysis of the Prepress Equipment Industry

14 Adapted from Porter, c1980
2.1.1.1 **The Bargaining Power of Suppliers**

Companies that supply prepress equipment manufacturers have a surprising amount of power. Overall, this factor has moderate to high influence on the competitive landscape of the graphic arts industry. This is largely due to the precision optical components needed to build an acceptable system. Optics vendors worldwide number in the handful and the graphics arts industry provides about five percent of their revenue stream. Because of the relatively small number of units sold, compared to the digital camera or military contract market, CTP systems barely show up on a company’s radar. Additionally, the graphic arts industry has very high quality requirements as well as other difficult to meet specifications. For example, coatings and alignment tolerances are difficult to maintain. In Creo’s case, several key components are single-sourced because the company has simply been unable to locate other viable sources. This necessitates high inventories of strategic components and complicates supply agreement negotiations. Other ramifications of this are discussed later in chapter four.

Labour has a significant amount of influence as well because of the high standard of performance required, particularly in the sales and service area. This workforce needs to have detailed knowledge of a baffling array of different products as well as an in depth knowledge of their customers businesses. Creo, because of its channel and service strategy, is dependent on very high performing teams. The sales team can strongly influence profitability by not maintaining enough pressure during the sales cycle and giving too much of a discount.

One factor that mitigates the overall influence of suppliers is that other major component areas, machined parts and electrical board fabrication, are fairly easily sourced. The local industrial base can be groomed and developed into maintaining the tolerances and quality necessary for CTP systems.

2.1.1.2 **Threat of Substitute Products or Services**

Despite the promises of many different technologies, fundamentally paper is still the best way to present fixed information. The contrast, resolution, color gamut and intensity cannot be matched by any other way of conveying data. Of the different ways of putting ink on paper, offset printing still provides the most cost effective way to produce printed material. This is only not true in some circumstances where the number of copies required is low or the format of the output is of a specific type. For 8½” by 11” pages and photocopies, laser printers and inkjet printers can provide better solutions. But for long run and larger format, these other technologies
are not competitive when compared to print. This cost and quality supremacy ensures the prepress equipment industry will have the offset print market to serve for quite some time. Of the competing technologies for putting ink on paper, inkjet is the closest competition because it is viable for smaller inkjet presses that would produce lower quality, but completely customizable output, for a comparable price. However, even this is quite a ways from commercialization.

The other main area of threat is the display technology industry, specifically the flexible display industry. Companies have been promising E-Ink and E-Paper for several years, though nothing has gone to market yet. Recently, Phillips announced that they would be producing displays by year end, but it remains to be seen whether it is able to deliver the new technology to the market. These technologies have the capability of fundamentally changing the way people access information, but a number of other issues need to be resolved before they become as handy as a book or magazine. For example, power supplies need to be improved, memory needs to become more compact, the displays actually have to be foldable or roll-able to a small diameter. Cost is a concern as well, as paper and ink are considerably more affordable and the consumer is not likely to adopt this technology until displays are more comparable. Additionally, it remains to be seen whether or not the technology can be easily scaled to size large enough to replace posters, banners, and billboards. Finally these technologies are not likely to quickly replace packaging material. Printing on packaging material is the highest growth area of the printing industry as companies use their packaging as a more vibrant part of their marketing strategies.

2.1.1.3 Bargaining Power of Customers

The bargaining power of customers, the printers who purchase this prepress equipment, is not an incredibly significant force in isolation. A number of factors have led to this imbalance of power in the sales cycles. The printing industry is quite segmented by tradition, scale and market focus. These bins have prevented the industry from consolidating in an overwhelming way. There are some incredibly huge printing companies in the world, but these can be counted on one hand and are actually a minority of the printing capacity in the world. Printing is an industry where the minimum efficient scale will allow smaller shops to exist despite the growth of the bigger corporations. These smaller shops compete viciously and need every advantage. Although this makes them interested in the value proposition of CTP, they remain very price sensitive, probably due to cash flow concerns. Fewer people in the shop and more control over
the production process are compelling prospects to any manager, and this need for the technology, because of the vast improvement it provides over pre-existing processes, reduces their bargaining power. Equipment providers know the need and use it to their advantage during the sales cycle. This, coupled with the complexity of the system, puts the customer at an even greater disadvantage. They are reliant on the sales people for advice on what to buy and how to put it together so that they can best extract the value promised to them. Additionally, the equipment providers are expanding their product offering into even more parts of the process, which, while improving the process, seems even more complex as these products are offered in a non-integrated form.

While the previously described complexity puts the customers somewhat at the mercy of the providers of equipment, the providers are also starting to offer fully integrated system bundles of software, hardware, and consumables. The bundles seem to simplify the product decision, but they add another layer of obscurity in front of the customer with respect to the pricing. So while they enjoy the pre-packaged solutions being offered, they lose even more bargaining power by actually requesting these bundled solutions. Different bundles have been crafted for each segment of the industry, making it harder for the segments to share product knowledge and reduce the information asymmetry with the sales team. This divide and conquer tactic has enabled the sales teams to keep the customers' bargaining ability from increasing too rapidly.

The exception to the situation described above is the largest scale customers. The major print companies of the world have tremendous bargaining power because of the scale of their purchasing. The prospect of standardizing hundreds of shops around the world is the dream of any prepress equipment product manager; however, these customers have reduced the information asymmetry in the buying process dramatically. These are the printers who first pushed for CTP, so have actually led the changes in their industry. They know the best practices and have worked with the equipment providers to develop the things they dreamed about changing. The system expertise they possess, as well as the scale of their purchases, enables them to bargain very hard for any purchases. Additionally, business people in these organizations are usually more financially savvy, and as such are less susceptible to the bundled pricing schemes. These factors all combine to give this segment of the printing industry significant clout during the sales cycle.
2.1.1.4 Threat of Entry

At this point in the industry, the threat of entry by additional competitors is not very likely. The industry already contains multiple large players who offer complete arrays of products. Laser imaging systems are large, complex devices that require tens of millions of dollars to develop. Additionally, these systems must be connected into a printer's workflow via seamless software interfaces that also require millions of dollars to develop. Finally, competition in this market requires the ability to bundle long term consumable contracts with the device. Because most consumable manufacturers also manufacture and sell equipment and software, this implies that to enter, one must also develop a consumable manufacturing and distribution capability. Again, building this capacity requires major capital investment. Altogether, one could estimate several hundred million dollars to enter, contingent on having the core technical know-how behind each element of the product bundle. Of any of the required initial investments, the software segment is the most easily duplicated, mimicked or attacked. The workflow of the printer is still evolving quickly in the face of digital technology, so entrance is possible via the turmoil of this change. This is probably the only conceivable route of entry into the entire industry, as it is possible that a software company with sufficient resources could enter via their software background and then acquire a smaller equipment and media company. However, this is perhaps better described as a change of management rather than entry into a market.

The printing industry is arguably the oldest manufacturing profession, and is therefore based on centuries of lore and "tribal knowledge". This makes the acquisition of product requirements more difficult because the knowledge required to provide value is less easily discovered and transcribed. This issue is mitigated by the fact that the size of the printing industry and its age makes a plethora of old experts available as sources of information. The transformation of this data into clear product requirements is still a difficult task.

The history of this industry also makes its members very brand loyal. Because of the commodity nature of putting ink on paper, printers have run on slim margins for a long time. They are very dependent on the availability of their equipment, and down-time erodes any profit very quickly. This causes the industry to only put its faith in companies who have proven themselves and their equipment. Reliability of operation, quality, service and delivery are all considered carefully. One industry giant, Heidelberg, is known for the incredible engineering and precision in their main product line, printing presses. While this piece of equipment is outside the bounds of the prepress industry, Heidelberg's reputation in presses enabled its long success in the prepress portion as well. New entrants to the equipment industry would face
intense scrutiny and be given very little room to prove themselves. They would be expected to perform to the industry standard while still developing their capabilities - a very difficult prospect.

Finally, the long term consumables contracts enable incumbents to sacrifice margin on new equipment sales and therefore punish any new entrants. This retaliation to entry into the prepress equipment industry would be on multi-sided. Equipment would be financed by consumables, consumables would be financed by equipment, and new sales would be financed by old revenue streams. The entrant would have to be very well financed and very resilient to weather the attack. No part of their organization would be given any room to breathe or grow.

Overall, these factors combine to make the likelihood of any new entrants into the prepress equipment market quite low. The exception to this is that a new software provider might be able to gain a foothold with exceptional new technology and without the intense capital investment required of the device and consumable providers in the industry.

2.1.1.5 Rivalry among Existing Competitors

Of the five forces, the rivalry among existing competitors is the most strong, and its intensity outweighs the levels of competition incited by the other factors. The industry has evolved to the point where the customer is looking for a complete solution, but the systems are too complex for customers to craft one on their own. This requires any competitor to either offer a complete suite of their own products, or ally themselves with another company to bundle the products into a solution offering. Creo changed the competitive landscape significantly in the last year by adding consumables to their product line. This is significant because previously, despite having the best imaging devices and software, they were hamstrung by the lack of a consumables offering. That gap has filled and it remains to be seen what the full implications are to the industry.

The competitive intensity is very high between the players, predominantly because the largest consumers of plates already have supply agreements; the very large contract portion of the industry is saturated. An equipment company gains only if another loses. Additionally, the long-term revenue streams the consumables contracts provide are attractive. In a sense, the other equipment is provided to enable the (more efficient) consumption of the plate media. For the customers to change from one media to another, the costs of the change in process are relatively high, so winning a long term supply contract can be lucrative and can ensure revenue continuity. The stability this business model provides helps the company plan more effectively and therefore
be in a more competitive position. A company providing only the equipment is more susceptible to purchasing downturns, while the company with the consumables revenue knows that plates will still be needed while an imaging device purchase can be put off almost indefinitely. Plates are the breath and blood of any print shop and will always be purchased.

Another factor that intensifies the rivalry among the existing competitors is the high fixed costs in the industry. R&D for the products is very expensive in each product category, and manufacturing facilities for the equipment and the consumables are also major investments. This cost structure pushes the incumbents to fight aggressively for revenue to offset the fixed cost component of their investments. Large scale CTP product development efforts cost the company $10 to $20 million in R&D spending alone and each sale provides on the order of $100,000 to $200,000 of margin, so it takes a significant number of devices to payback the development costs. The pressure to make the product profitable is high and difficult, particularly considering the portion of fixed costs to marginal costs.

The complexity of the product offering and solution bundles allows another form of competition to emerge: in the quest to differentiate and extract additional contribution from each sale, the product managers have engaged in a product specification duel to the death. Channels of imaging, device productivity, in-line punching, single cassette unit, multi-cassette unit, multiple loading configurations, imaging resolutions, screen resolutions, over-sampling, proofing options, multiple media types, and service contract variations are but a small sampling of all the different options a customer must track to ensure valid comparison between the myriad of sales proposals. This type of competition is difficult to avoid even though it sometimes diminishes the focus on real problems or better ways to provide value to the customer.

2.1.2 Critical Success Factors

The single biggest critical success factor in the prepress equipment industry is having a complete line of products to offer and bundle. Without this combination of hardware, software and consumables a potential player in the market would not be able to structure a sale to be both competitive and profitable. Creo has already addressed this success factor by introducing its own consumables offering. The introduction of this offering allows Creo to offer a fully bundled solution without having to be dependent on a partner for a portion of the solution package. This also allows Creo to extract the full contribution, whereas the profits previously had to be shared in a partner strategy.
The second critical success factor is the reduction of the power of the suppliers of key components in the imaging systems. This situation shackles an equipment provider by making it dependent on the innovation and quality control of the suppliers, with few alternatives. This has slowed Creo and hindered it from maintaining as strong a technical advantage over their rivals. It has also kept Creo’s cost structure higher than necessary and therefore reduced its profitability. The sourcing of these components is a difficult prospect due to the increased risk of divulging trade secrets. Also, the simple fact that any prepress equipment manufacturer’s order quantities are well below the minimum efficient scale of the component manufacturers means that they will never support a large diversity of suppliers. It is difficult to even get suppliers to quote when they learn of the potential size of the business; it is simply not enough units to justify the trouble, particularly considering the high tolerances required for use in the systems.

Finally, equipment providers also must continue to pay attention to possible substitutes. This is not an immediately pressing concern, but the development cycle of any new technology is long enough to warrant constant, long-term surveillance. For example, if Philips follows through on its promise of millions of flexible displays by 2005, Creo needs to be well positioned to deal with this. These technologies often use printing-like techniques, so re-positioning and market shift strategies must be developed to proactively anticipate either eventuality.

2.1.3 Industry Analysis Conclusion

The prepress industry is a very competitive industry due to the near saturation of a slow growing market, coupled with the need to provide end-to-end solutions across a diverse range of technologies. Because of the scope of these challenges there is little chance of new competitors entering the fray. The power of other constituents up and down the value chain is higher than desired, but still manageable. Substitutes are a concern for the longer term, but still probably years away from full commercialization. Developing the next viable substitute would be a grand opportunity for any competitor, but it is more likely that the technology for that substitute will be developed outside the traditional graphic arts industry.

2.2 Value Chain

A detailed analysis of the chain of value-added activities provides an interesting glimpse into the heart of the graphic arts industry. This methodology shows where a company must focus its efforts in order to stand out among its competitors. While the prepress equipment industry is much like any other business equipment industry, it does possess some unique subtleties due to
the refinement of the printing process and the technologies involved. This section will first examine the prepress equipment industry’s overall value chain and then look at how Creo delivers value to its customers via all the organization’s activities.

2.2.1 Equipment Industry Value Chain

The general equipment provider value chain in this industry is described in Figure 2 which also shows how much of each link in the value chain Creo performs internally. The depth of involvement is displayed qualitatively by the darkness of the blue color in each shaded box. The value chain operates as follows: a company does some research and development to address a particular problem or to apply a certain technology to a specific process in the pre-press environment. If an analysis of the value and business prospects of the resulting product meets a company’s threshold financial requirements the company will manufacture and market this product to the printing industry. The sale of this equipment is done through two basic channels, direct sales and dealer sales, though secondary markets exist for used equipment.

![Figure 2 - Prepress Equipment Value Chain](image)

As much of the equipment is complex and mission critical, continuity of equipment operation is crucial to the livelihood of the customer’s business. This necessitates the presence of service capabilities in the industry to maintain the equipment and software. Finally, the digital information must be translated to the physical world on some type of media. Providing consumables to be used in the equipment designed and sold earlier in the value chain is the final step in providing printers with a better way to produce plates for their presses.

2.2.1.1 Product Development

Almost 100% of Creo’s R&D and intellectual property come from within the company. A tremendous collection of engineers and scientists in a variety of fields push their respective technologies to the limit, creating innovative new products. This internal development is

15 Adapted from Porter, 1985
supplemented via acquisitions or partnerships with other companies. These partnerships are often strongly guided by Creo as the system vision invariably comes from the Creo engineering team. One could convincingly argue that Creo’s real competence is systems engineering, not optics or software.

2.2.1.2 Manufacturing

The products that Creo designs are produced in-house, with the small exception of software installation CDs, which are produced by sub-contract manufacturers. This is solely for cost reduction purposes, as there is no value added in Creo burning the CDs versus another company producing them. For the consumables products, Creo has made some significant plate manufacturing acquisitions to give itself the necessary control over quality. Contract manufacturing did not assure the required level of consistency or allow Creo to capture enough of the value of the sale. Creo attempted to sub-contract the manufacture of the plates for a period prior to acquiring its own coating capability, but the business agreements and performance were not satisfactory.

For the prepress devices, all manufacturing is done in-house. The engineering teams are responsible for producing and supporting units through their beta period, but hand off the products to the manufacturing teams once the Beta is finished successfully. This allows a detailed hand over and provides the manufacturing team with a wealth of information to help deal with any problems. The downside is the potential for dragging out the engineering, with the product never quite being finished. Also, having the engineers close to production makes both sides less disciplined about documentation. This has impacts down the road as problems resurface after the experts have moved on to other projects, or after the required knowledge has faded from the memories of those who tackled it previously. The situation has a tendency to encourage lore or “tribal knowledge”, which can be difficult to dislodge from the cultural memory of the teams, even though it is not based on hard evidence.

However, despite these drawbacks, the complexity of these products demands that they be manufactured in-house. This close proximity to engineering allows for far more rapid product introductions and significantly reduced time to market. It eliminates the sometimes lengthy process of sourcing a reliable sub-contractor. In-house manufacturing also provides the opportunity for better quality control, which is very important in a quality differentiated product. Finally, it provides for better protection of intellectual property and trade secrets.
2.2.1.3 **Marketing**

Creo does the majority of its own marketing, and uses a structure where each product core team is headed up by a product manager who has the bulk of the marketing responsibilities. He or she determines the specifications and requirements for the product in the development stage. They determine the value-based selling message, set pricing and discount levels and develop marketing material for use in the field by the sales force. Since Creo sells mostly via direct channels, another major responsibility is educating the direct sales force about the product in question. In geographic regions where dealers are used, the product manager is also responsible for negotiating dealership agreements.

All trade show activities are also handled in-house, although the detailed engineering design of the booths is sub-contracted. Advertising is one area where Creo does out-source, possibly because, not being in a consumer market, there is an insufficient amount to be done to be able to develop the in-house competence.

2.2.1.4 **Sales**

The equipment bundles Creo offers are major capital acquisitions for the customers. They are laying out potentially hundreds of thousands of dollars for mission critical products. For these amounts of money they attempt to be diligent in their evaluation and expect a certain level of service during the sales cycle. The customers want to be wined and dined while the product value is explained to them. This kind of sales environment results in a long, expensive sales cycle that is potentially better served by a direct sales force. This is why Creo predominantly uses direct channels to put their product into the market. Certain regions have required the development of dealer channels (an indirect sales force) but this is always due to an inability to develop a direct presence in a timely manner. Once the region matures, Creo continually looks for ways to reclaim the channel as they do not like the deep discounts they have to provide to the full service dealers.

Dealer management is the responsibility of the customer service region in which they are located, so there is a lot of regional variation in how the dealer contracts are structured and even in how the dealers are selected. Additionally, many of the current dealers were inherited during the merger with Scitex, so they were not selected using criteria that are current or meaningful. Creo is starting to understand that dealers may be more appropriate for the broad market if it decides to focus some efforts in growing in that market segment. Unfortunately, Creo has burned
some bridges in that dealer community, so it may be difficult to re-establish that channel, especially in North America.

2.2.1.5 Service

CTP systems are crucial to the operation of a printer, but large electro-mechanical systems controlled by complex software can have many failure modes, which makes a printer’s business vulnerable. The ability to troubleshoot and repair these systems; to keep them running and keep the printers printing, is crucial to an organization trying to sell these systems. Training a third-party repair service would be difficult due to the complex and rapidly changing nature of the technology. Additionally, revealing the detailed workings of these systems could expose some intellectual property unnecessarily. Due to all these factors Creo does the vast majority of their equipment servicing. The only exceptions to this rule come about as the result of distribution agreements. In the past, Creo participated in a joint venture with the German press manufacturer, Heidelberg. This joint venture gave Heidelberg the right to manufacture, sell and service a co-branded CTP device. This JV has since been dissolved and many of the service contracts have been repatriated by Creo, but some of these installations are still maintained by Heidelberg.

Additionally, in those regions where dealers are the main channel for the CTP products, in many cases those same dealers also provide the service for their customers. This prevents Creo from having to build a costly field service organization in less developed regional markets.

Disturbingly, Creo is starting to notice the growth of a number of third-party grey-market service providers that claim to be able to support Creo equipment. Some investigation has revealed that some of the field service engineers who have been laid off during the cost reduction periods may have started working for these unauthorized service providers. This is a problem for several reasons. One, it gives customers an alternative to a Creo service contract, which puts price pressure on that portion of the company’s revenue stream. Second, the user interface to Creo equipment exposes the detailed operation of the system and does not protect any intellectual property very well. This exposure has not proven to be catastrophic, but has created some difficult customer situations, especially when other media vendors acquire some understanding of how to operate the imaging systems. Finally, it is questionable whether the service provided by these other organizations will best serve the needs of the customer - other portions of their process may suffer due to improperly maintained equipment. It is also worth
noting that the engineers laid off during the cost reductions were the lower-performing support personnel, and they presumably do not provide high quality service.

2.2.1.6 Consumables

The last stage in the Pre-Press Equipment Value Chain is the provision of consumables for use in the CTP device. The number of plates used by a printer is directly related to the number of print jobs that a shop is hired for and, therefore, is tied to the market share that the printer is capturing. Perhaps more crucially, the consumables dictate much of the equation when it comes to quality and ease of print. Dot resolution, “ink-up” time, and run length are all examples of characteristics that make a plate good or bad. Because printers cannot operate without the plates, plate supply must be reliable. This is a big factor when they are choosing a vendor. Additionally, the learning curve effects a print shop experiences when changing the type of plate they use, makes switching less of a threat and long term supply contracts a possibility. Because of the stable nature of these long term agreements, equipment providers are willing to substantially discount equipment and software sales to capture a consumables sale.

Creo has only recently brought the provision of consumables in-house. Previously, it negotiated bundling deals with consumables providers in order to offer complete packages to customers. Because of the shared nature of the resulting revenue, neither side was particularly happy about the other’s presence. This dynamic prevented sales from reaching stated goals. The introduction of in-house plate development and production allows Creo to capture more of the value chain and more effectively bundle package solutions together to meet the needs of its customers.

2.2.2 Firm Level Value Generation

Breaking down Creo’s operations with Porter’s Value Chain analysis technique provides insight into what Creo should be doing internally and what functions it is better off sourcing externally. This will help identify true core competencies and help clarify which strategic decisions with respect to allocating resources in various parts of the company should pursue into the future.
**Figure 3 - Detailed Value Chain Analysis for Creo**

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16 Adapter from Porter, 1985
A generic view of a company's internal value chain consists of a set of primary activities: inbound logistics, operations, outbound logistics, marketing and sales, and service; and a set of supporting activities: firm infrastructure, human resources management, technology development, and procurement. Each of these activities can be further broken down into specific departments within a company that fulfill the various business needs of the corporation. Creo's specific value chain is detailed in Figure 3

2.2.2.1 Firm Infrastructure

2.2.2.1.1 Finance

The finance department at Creo is responsible for the normal set of finance activities. It incorporates the Investor Relations, Planning and Analysis, Treasury, Accounting and Controller, and Travel functions. Investor Relations consists of one person who is responsible for all communications to the investor groups. This person works closely with the executive team to develop the Quarterly Results reports and the Annual Report. The Executive Team involved consists of the CEO, COO and President of the company in addition to the Chief Counsel and VP of Strategic Planning. More mundane tasks include drafting press releases as required by the Generally Accepted Accounting Principles (GAAP) on material occurrences throughout the year and other such communications.

The Planning and Analysis team is responsible for consolidating the company-wide budgets and forecasts and then generating pro forma projections to assist the leadership team in decision making, as well as assisting the operations team in evaluating goals. The budgeting process is one that is improving at Creo, as the company is now being held very accountable. Years of slim to non-existent profits have increased Board scrutiny of how the company is managed. In 1999, just after going public and before the economy hit a downturn, budgeting was not very disciplined nor was it worthwhile. Budgets were submitted on a project basis once a year and never checked by anyone for accuracy. There was no way to tell whether or not a project was really achieving its goals or overspending. Now, the budgeting process is done much more rigorously. Each project submits an Annual Operating Plan (AOP) with expected material, labor, travel and other expenses for the year. These budgets also track individuals and full time equivalent headcount (FTE HC). This is important because with the de-centralized nature of Creo, hiring used to go unchecked and seriously increased labor expenses with very little management visibility. Subsequent to the AOP, a 12 month forward looking Quarterly Operating
Plan (QOP) is generated each quarter to check and revise the previous estimates. Any changes and divergences need to be justified and are reviewed by the regional operation leadership. In Canada that is the Vancouver Management Forum, which, because this is the corporate headquarters, also includes corporate leadership representation. One issue that has seriously hampered the ability to manage the global company’s financial books has been the disparity of enterprise resource planning (ERP) systems between each region. This consisted of two ERP’s and multiple versions of each. This is finally being eliminated, but has been years in the works. Finally, the Vancouver Management Forum also reviews the forecasts versus actual results on a monthly basis to ensure the QOP’s are accurate. In an effort to better control costs and improve profitability, Creo has gone from being an undisciplined small company to being a very disciplined organization.

The other half of the Planning and Analysis function is the forecasting and reporting of sales. This team works with the regional sales team to get sales estimates by geographical region and product type. These estimates are consolidated and combined with the cost forecasts (AOP and QOP) to develop the company’s financial guidance to the investment community. In the past the sales forecasts have not been as accurate as necessary, but now the corporate leadership team has a Revenue Generation meeting with each region on a monthly basis to check on and encourage the progress of each sales team. It is not yet clear whether this is having the intended effect.

The Treasury team is starting to provide company-wide differentiation by investigating and implementing in-house leasing functionality to help assist sales. This is a new initiative at Creo and has the potential to move down-market while still maintaining differentiated margins. It is not certain this is a viable market segment for Creo’s products, but financing will help reduce any potential barriers.

The Accounting group handles the typical transactional accounting functions of any business: accounts receivable, accounts payable, etc. As stated previously, the company has not had the global reporting capability necessary to effectively manage the corporate finances. The accounting team has been crucial to the effort of the ERP rationalization in terms of defining requirements as well as stream-lining and adapting those processes to reflect the needs of a multinational company using a single financial software system. Creo also relies on a significant amount of accounting consulting with from its auditors, KPMG.

The Travel team is a surprisingly effective part of the Finance organization. Creo’s Executive, Sales and Service groups all travel extensively and corporate travel costs have been
progressively rising over the last several years. This was partly accelerated by the merger with Scitex and the acquisition of another product development center in Israel. Even after extensive sourcing efforts, Creo was never able to acquire travel services that gave it the best rates possible. An external agency could never be incentivized to align its interests with Creo’s, so Creo paid more than necessary. Since developing an in-house travel department Creo has saved several hundred thousand dollars per year, more than justifying the staff expense. Developing this in-house capability gives Creo an economic advantage by helping keep its cost structure low.

2.2.2.1.2 General and Administrative Services

The G&A group at Creo consists of Office Services, Facilities, Information Technology, Legal, and Intellectual Property. The office services team is a functional team consisting of the receptionists from each of the buildings. This is a very region specific function and is allowed to operate in a manner best suited to its specific location. The office services are also responsible for general building operation, office supplies, mail delivery, parking management, and so on. That team works closely with the facilities team, who are responsible for building maintenance, construction, utilities, and security. The Facilities team is kept fairly small and now acts as a contractor coordinator, though they are still capable of performing basic repair services.

The Information Systems (IS or IT) group is split into three main groups: Applications, Infrastructure, and Knowledge Management. The Applications group is responsible for in-house development of software for various activities. As Creo has shifted to a consolidated ERP system, this group has shifted to become SAP experts and programmers. Fewer general programming skills are needed or kept in-house, but Creo has perhaps developed more SAP-related skills than the average company. These abilities allow Creo to generate new ways of looking at the existing pool of product, service and financial data. While it is difficult to cite a specific example of how this has created differentiation, developing this capability has enabled the company to catch up to industry best practices and provides the potential and hope for innovative applications in the future.

The Infrastructure group is responsible for the phone, server, network, software, and helpdesk infrastructure at Creo. They maintain the servers, firewalls, desktops and laptops throughout the company. Creo was an early adopter of network technology and has a very robust infrastructure. This infrastructure has helped enable product development at multiple sites as well as load-balancing expensive lab equipment within a site. It has also greatly enabled Creo’s remote support staff. Although often hindered by the network infrastructure at the customer site,
Remote Support engineers have a full library of technical information at their finger tips as well as the ability to contact many of the original design engineers immediately, all because of an excellent data infrastructure. One of the project engineers in the Thermal Laser product group often reflects on how amazing it is that he can troubleshoot, debug, and experiment on systems in other time zones from his own home because of the robust network Creo possesses. This clearly creates an advantage in many areas of Creo’s business.

The Information Systems group is not without its problems however. It has been responsible for a significant portion of rising G&A expenses for several years. This is partly due to generally poor budgeting at Creo and partly due to an expensive multi-year ERP implementation, but is now being managed more closely by a newly created management forum called the Business Transformation Steering Committee. This group is tasked with evaluating the business case of every IS proposal to ensure it enhances profitability. It is another example of how the decision making process at Creo is becoming more centralized.

The Knowledge Management group is responsible for providing the infrastructure for activities like documentation, translation, instructional design and training. This group develops the tools, templates and processes for disseminating information to the field, but relies on the Product Development groups to provide actual content. The Product Training Group is responsible for training the Creo service organization and Creo customers. They have done an excellent job of both high performers who have enhanced their competency through working closely with engineering and the field, which gives them rich sources of valuable information. The other functions are done at a normal level of competency, with Translation and Instructional Design being centralized and Documentation being distributed directly into the product core teams.

The Legal department and the Intellectual Property (IP) groups are separate, but are often motivated together. Creo has been embroiled in a number of expensive law suits over the years, most of which were concerned with IP issues. The risks associated with IP as well as the increased corporate rigor required of a public company have motivated the creation of a small Legal department consisting of 3 lawyers and a paralegal. Counsel is available to any Project or Product Manager at Creo on matters such as contract negotiations, non-disclosure agreements, licensing agreements, etc. This team provides Creo with invaluable services, but none that are differentiated from another company or are a core competency.

The Intellectual Property team are rapidly creating a new core competency for the company. Despite being founded on innovative products and ideas, Creo did not protect these
ideas well and paid for it in the past. However, the company has learned from these past
oversights and now has a small but dedicated and efficient group focused on ensuring Creo’s
intellectual property is properly protected. Though they have not gone so far as to create the
infamous patent thickets of the bio-tech industry, they are working closely with all areas of
Product Development to ensure every new idea is at least assessed for patent status. The staff
within the IP group is in frequent contact with the CTO as well as the Engineering Managers of
each group to ensure ideas are not overlooked, and they help guide the scientists and engineers
through the invention disclosure drafting as well as the patent writing process. They will even
take on the bulk of the patent writing process themselves after extensive consultation and review
with the inventing parties.

2.2.2.2 Human Resources Management

The human resources functions at Creo are filled much as they are at any company of
equivalent size. Similar benefits packages are provided, the same kinds of services are offered,
etc. However, as a company, two of Creo’s HR practices stand out as special and as core
competencies: the first is the hiring process. Creo has long held the policy that it is better to
leave a posting unfilled than fill it sooner with a sub-standard candidate. This philosophy has
been fundamental to building an extraordinary talent base, both on the technical side of things as
well as the business side. This policy is backed up by an exhaustive interview process in which
candidates meet almost everyone who has input on the position. After the interviews are
complete the group meets and comes to a consensus on the hiring decision. This kind of
openness to input has allowed Creo to build teams that work well and have relatively few
personal conflicts.

The second area that Creo has distinguished itself in the HR realm is the review process.
Creo was an early adopter of the 360 review or peer review process, and this was fundamental to
its flat organizational concept. Anyone is able to review anyone, and the people responsible for a
specific person’s review are supposed to guide, facilitate and clarify the feedback process.
Employees are provided with multi-page reports detailing the quantitative assessment of their
performance as well as thorough comments on a variety of guided topics. The 360 review is
crucial to the credibility of the flat organization philosophy, because it is in the review process
that power manifests itself. Theoretically, if an individual can review anyone then that
individual has as much power as anyone else. In reality this is not entirely true, but it is a good
fiction to drive a good philosophy. The review process at Creo is a multi-stage, multi-month
process that involves everyone. Its current form is described below, but there are concerns that the review and ranking consolidation processes are too expensive so revisions are in the works.

The review process starts with the primary reviewer identifying and assigning who they think should review the reviewee. Once this is completed the reviewers are able to log in and review these people. Everyone is also able to add anyone else for whom they would like to provide feedback. As a reviewer, each person is able to make their feedback anonymous (a point of great and continual debate at Creo) or signed, however they see fit. People are reviewed on a quantitative (although still subjective) scale as well as with qualitative comments. This feedback is compiled into a report and reviewed with each employee on a yearly basis. Any questionable or contentious feedback is followed up on by the individual’s primary and secondary reviewers. Finally this feedback is used in setting goals for the coming year including career and personal development goals. Creo does not always follow up well on the development planning and monitoring portion of this process, but initiatives to strengthen this process are underway as well.

The results of this review are then part of a ranking process which is used to allocate discretionary compensation. In the past this discretionary compensation was stock options, but because of shareholder opposition to the use of options, this will likely be shares, bonuses and salary increases in the future. The ranking meetings are a chaotic affair in which a large number of managers and leaders argue over the absolute and relative positioning of everyone in their product group. The product group rankings are then consolidated and rationalized with other product and functional group until everyone in a region is ranked on a single scale. The regions are not consolidated as it is thought there is insufficient visibility across the regions to make a fair consolidation.

The review and ranking processes are not clean, tidy or particularly efficient, but they do provide an excellent method of determining a person’s real contribution to the company as compared to their co-workers. This open process has helped attract and retain many of the top engineers in BC and from abroad. It is this talent that really gives Creo its edge in its core competency of Technology and Product Development.

A Training and Development team exists in HR to support career and development planning. This team also assists in sourcing specific types of training as well as defining the training reimbursement policies for the company.

Lastly, each Product or Functional Group in the company has a HR Generalist on staff. This person is a local HR contact who works closely with the Group Leaders (a VP level position) on all personnel-related issues. The Generalist fields all questions related to HR
functions and also are heavily involved in resource transitions, lay-off planning and the coordination of the review and ranking process.

2.2.2.3 Technology Development

Called Product Development at Creo, these groups are the biggest source of differentiation at Creo and the main core competency of the company. This is also where one sees the primary working unit of Creo, the Core Team. The Core Team is a multidisciplinary team that is responsible for implementing the full set of commercialization activities from the given product or service. It might consist of a Product Manager responsible for the market evaluation, development, sales team interfacing and pricing, a Project Manager (responsible for budgeting, building and allocating resources for the technical team), a Project Engineer who is responsible for the technical details of the project, a Project Support Manager who is responsible for the service aspects of the product including reliability, documentation, sparing, service tools and service training; a Production Manager, who is responsible for setting up all the production capabilities needed for the product, and can also include a number of other people depending on the needs of the product.

Each core team is tasked to operate as a small independent business unit, but is guided and restrained by product group steering committees. These steering committees are generally comprised of the rest of the Core Team Leadership from the Product Group, but also include regional representation from the sales, marketing and service organizations. Creo uses a multi-stage, milestone-based product development process and before a core team moves into the next stage of product development they must go to the product group steering committee to get approval. For certain major milestones the core team must also go to the Global Product Steering Committee to get approval to move on to the next stage of the product life cycle. This steering committee includes the very top levels of corporate leadership and gives corporate leadership the ability to guide the varied products into a cohesive strategy for the company.

Creo’s product development groups are divided into four main areas: Imaging Devices, which consists of plate-making devices and the laser systems they use; Printing Workflow Solutions (PWS), which consists of all the software products that Creo engineers; Ink Jet Products (IJP), which consists of the ink jet proofing devices as well as their consumables; and Thermal Consumables (TC), which is Creo’s newest product group that designs the plates and accompanying processor chemistry that Creo now manufactures and sells. Other, smaller, product groups are contained within each of these four main organizations. For example, the Flat
Bed Imaging Device team reports to the TC group largely because they are both new businesses and the Product Group Leader responsible for both is good at developing industry presence.

2.2.2.4 Operations

Creo’s Operations team spans a large segment of Porter’s traditional value chain diagram (see Figures 2 and 3). Procurement, Inbound Logistics, Operations, and Outbound Logistics are all bundled together into one organizational group with one Corporate Vice President responsible for all these activities. This gives cohesion to the group that would otherwise not exist, especially considering that the operations group is subdivided by product line. There is a miniature version of the whole team in each production facility, as each building roughly aligns with a product group. The Thermal Head manufacturing team works in the Kincaid building; it has its own shipping and receiving facilities; it staffs specific vendor manager positions for the specialized components it needs; and it has its own QC department to check and test those components. This kind of compartmentalization allows each product group to act as an individual business, which is an extension of the core team ideology, and enables the flexible use of the buildings Creo owns, which has proven to be necessary because of the way Creo grew in the late 1990’s.

In a sense, the Operations team is more like a functional group in a matrix organization. It is a set of disciplines that is required in a variety of places, but it is brought together to help create efficiencies where possible and to provide for the efficient sharing of best practices.

The strength of the Operations Group at Creo lies in the specialization of the separate sub-groups. The Thermal Head Manufacturing team is more closely aligned with the Thermal Heads Engineering Group than it is with the IJP Manufacturing team, again largely because of the core team construct. These close ties to engineering greatly facilitate the debugging of products, speed up cost reduction while improving reliability, and ensure the product is able to evolve rapidly in the face of encroaching competition. This benefit seeps into every process: the buyers better understand the components they are sourcing, and so are more able to negotiate on complex items. They are also able to work with the suppliers to improve the components Creo buys, often without any increase in price. The service logistics team is able to help organize Beta sites and ensure they are supported efficiently while also gathering important feedback on product performance in the field. Finally, the Engineering Change Coordination group keeps the ERP systems up to date with the latest documentation and part numbers resulting from the changes brought about by the close ties of engineering and production.
These close ties do have a downside in that it sometimes appears that a product is never finished. The lines of responsibility between engineering and production are somewhat blurred. The handover can be less formal, so therefore the products are not as well documented as desired. Over time, knowledge is lost because people move on or forget, and if a problem crops up at a fundamental level, sometimes it can be very difficult for the teams to resolve them without recreating a tremendous amount of work. Overall the trade-off between the benefit of time to market and any engineering/production confusion has been more beneficial than not, but some gaps exist in the understanding of the product by the production team, gaps that need to be filled.

Within a specific product group, the operations team works in an almost textbook fashion. Components are sourced by purchaser in quantities determined by planners. Those parts are received, go through component level QC and are integrated into subassemblies. These subassemblies are then put together to create the product in question, which is then operationally tested to verify quality. The products are then crated, shipped and installed by the field service organization.

The increased financial discipline in the company has extended to manufacturing as well. The Creo operation team is espousing the concept of Lean Manufacturing or Lean Thinking heavily. Lean Thinking is a set of principles for operation developed by Japanese automotive manufacturers that have taken the western manufacturing world by storm. These principles espouse eliminating as much waste as possible in any process and focusing on the steps that actually provide value to the customer. Various “Lean” projects have been done, some to great effect. One manufacturing line saw a 25% increase in capacity with no increase in personnel or space. This concept and the techniques of value mapping are being pushed out to vendors in hopes it will bring future cost reductions and to other functional areas of the company in hopes it will increase Creo’s productivity. Some of the techniques do not apply well to Product Development or Marketing activities, but basic concepts such as focusing on the parts of a process that bring value to the customer and keeping a clean and tidy workspace to avoid inefficiencies are simple common sense. It is too early to tell how large of an impact these new concepts will have on company overall, but the quest for improvement is encouraging.

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17 Lean Enterprise Institute, Training, Lean Pathway [online]. See www.lean.org
2.2.2.5 Marketing

With the exception of several infrastructure activities, Marketing is largely handled within the Product Core Team by the Product Manager. This person does much of the market research, defines the product specification, works to develop channels appropriate for the product depending on geographic region and organizational fit, and sets pricing for products, bundles and service levels. To help assess the regional variations each region has a Product Marketing Manager who is responsible for working with the Product Manager, aiding in the gathering of information, and helping implement and tailor the global marketing strategy for the region.

While the core team structure works very well, it does rely on the marketing strength of the Product Manager to really stand out. Therefore it is difficult to say marketing would be a core competency of Creo’s. This positioned is recognized as crucial and highly leveraged, so the leadership team is very particular about selecting individuals to fill these roles, but inconsistency prevents true organizational strength in this functional area.

The marketing infrastructure that supports the Product Managers consists of the Demos and Benchmarks team. This is a team of skilled operators and presenters who have to show perfect operation of the product under the close scrutiny of suspicious customers. This demo capability is required in this industry, and is similar to the test drive of a car, although even more demanding. Customers will send real print jobs via the internet to demonstrate the software products and expect real plates back to use them for a paying job. The stakes are high as the demos can strongly influence sales, but this area is not particularly differentiated from Creo’s competitors.

The marketing services team provides graphics and documentation assistance to the Product Managers to maintain style standards and professional looking brochures, etc. There are graphic design resources to aid in any variety of print or video production. The Global Marketing team is responsible for the logos and trademarks and is tasked with building a strong brand overall, that is less tied to specific products.

Finally, of special note, the regional marketing teams are the main points of contact and are responsible for Creo’s presence at the major trade shows. For example, for the DRUPA show, which was held in PLACE in May 2004, the European marketing team was hard at work setting up the booth, arranging for equipment to be there for demonstration, etc. These events allow each marketing team to display their skills and expertise, but is closely monitored by the Global Marketing group, as trade shows are very important in the graphic arts industry.
show presence has become a competency of Creo’s, and it is recognized for interactive, interesting and informative booths at many of the shows.

2.2.2.6 Sales

The Sales team at Creo is a field organization that is organized regionally. Each region has a sales leadership group that is responsible for the performance of the salespeople in that region. Each region organizes itself slightly differently (as appropriate for the specifics of the region). For example, the sales team in Europe is organized around geographic and language boundaries. The sales team in North America is organized around industry segments as well as geographic boundaries.

The sales team focuses on traditional direct sales techniques, and, in a business-to-business transaction, they are selling the value of improved profitability to the customer. The level of service expected makes it necessary for the sales people to know the printing industry almost better than the printers. Because of the high knowledge level required on the business side of things the sales team has a technical sales support (TSS) team to help assess and determine what specific product combination and configuration will best suit that particular printers needs. The salespeople speak with the owner or general manager of the company while the TSS works with the foreman of the prepress shop.

The sales team in North America has always been entirely direct and is definitely the most mature sales team in terms of its product line knowledge and its ability to sell Creo’s value proposition. The other regions rely much more on dealer networks and have a less developed and experienced sales team. Much of the dealer relationships were inherited from the Scitex assets during the acquisition, so it could be inferred that the portion of the sales team that originated with Creo is the stronger of the two.

Dealer channels at Creo are selected according to a number of criteria that vary from region to region. Each region has the authority to decide what dealers will best distribute Creo equipment in that geography. Creo classifies dealers into four categories based on the level of products and services they provide: the lowest level might only carry ink jet consumables and receive a discount of approximately 8% whereas the highest level will carry the entire Creo line and provide some kind of technical support as well. These dealers are entitled to the deepest discount on Creo goods. This discount also varies from region to region and is specific to the dealer, but usually ranges from 25 to 30%. The dealer relationships are usually managed by a sales manager in the region tasked specifically with indirect channel management. These sales
managers are also responsible for monitoring dealer performance and enforcing any dealer contract requirements.

Creo is now attempting to reclaim the distribution channel in Europe to help capture much more of the value of each transaction. Corporate leadership believes that the direct channel is far more profitable than the indirect. The amount of channel reclamation that is occurring in each region is a function of the market projections in each region. For example, there is very little attempt to develop direct sales channels in Latin America because the market is not large enough to support the relatively expensive direct channel. However, efforts are underway to develop a sales force in China and other parts of Asia Pacific as this is seen as the next area to experience significant CTP equipment sales growth. The oscillation between direct and indirect channels in Europe and North America has damaged Creo’s relationship with some of the more influential dealers in those regions, and this could unfortunately hamper any efforts to re-establish the indirect channel if it was ever decided it was more appropriate for CTP. This is likely if Creo decides to focus on the broad market.

Order fulfillment is the responsibility of the individual salesperson. He or she submits the purchase order agreed upon to the order management department at Creo. Once the device and/or software are ready for shipment, the service organization will install it, but responsibility lies with the sales person to follow up with the customer to ensure everything is to their satisfaction. After the initial sale, the consultative nature of the sales cycles morphs easily into follow-on meetings and potential additional sales.

2.2.2.7 Service

The Service organization is in a fair amount of flux right now. Boundaries between different functional teams are being redrawn in an attempt to refocus the entire company on improving customer satisfaction. Along those lines, a lot of remapping and renaming is occurring, but realistically all that is changing are lines on an organizational chart - the core functionality behind it remains the same. New processes are not being created; rather Creo is looking at these core processes through a different lens. The management team in the Service group has a history of reorganizing every two to three years. It may be warranted due to the difficult job of providing world class service to a large customer base, but it does raise questions about whether there is too much focus on organizational change rather than improvement.

Despite these potential management problems, Creo has always had and still maintains a reputation for excellent field and remote service. These two groups are the primary functional
teams of the customer service organization. The service engineers are put through exhaustive training on a wide variety of products and then introduced to the real service environment gradually, through an informal internal apprenticeship methodology. Once they are ready, field engineers then take ownership of maintenance and break-fix repairs for a set of sites. They cover a specific region for installation services, but are not necessarily the owner of all the sites they install. This is necessary for load balancing between engineers.

The engineers are experts at the use and servicing of the devices and software Creo produces. Many are also experts on other areas of the prepress process as Creo tries very hard to hire those with previous experience in the industry. If the service engineer is unable to resolve the problem, they then escalate via a pre-defined communication chain that generally ends in the engineering team or original designer of the product. This ability to go back to the source of expertise enables Creo to resolve the vast majority of service issues without replacing entire devices or installations.

Prior to dispatching a field service engineer to a call, a remote support specialist (RSS) has probably been dealing with the problem via a network connection. The RSS’ receive the same training as the field team does, but specializes in solving problems over the phone. They have excellent remote resolution rates which helps keep the cost of service low, as RSS time is about 6 times less expensive than field engineer time. The RSS’ work in the Response Center (RC), which is a twenty four hour a day call center staffed by the technical support team. The RC in Vancouver covers North America and Asia Pacific during the day and the entire world during the night. Europe also has an RC, but it is only staffed during their normal working hours.

Creo’s reputation as an excellent service organization stems almost solely from the service engineers legendary ability to keep equipment running or get it running in a timely manner after major problems. As stated before, the equipment Creo sells is crucial to the continued operation of any print shop. In the event of equipment breakdown, the ability to rapidly get the equipment running again is essential. This idea has led to actions which result in stories about the almost unbelievable situations in which engineers find themselves, and the training classes are replete with tales of heroic efforts taken to get the customer up and running again. This culture of “whatever it takes” has helped make Creo a successful company.

The turmoil of the merger and the difficulties of the economy caused Creo to lose sight of the efforts required to maintain its reputation for top quality service. The field service organization suddenly had twice the product line to deal with, and a service team that was only knowledgeable about the products from their respective company of origin. Surveys of the
customer base and anecdotal feedback showed that the service levels had fallen off alarmingly. Creo was in danger of losing a vital element of its differentiation. More recently, Creo has been more focused on delivery the quality of service it used to be known for in the industry. A lot of effort and drive from the very top leadership went into driving the message out that the entire company needed to take a close look at how it was going to improve the service it provided. This has had a beneficial effect and fewer reports of poor service are heard. Creo has not yet redeveloped service provision into a core competency, but is on its way.

2.2.3 Conclusion

This analysis reveals how Creo creates real value for its customers. Starting by recruiting the best and brightest in each product development region, Creo researches and develops products in an impressive array of innovative technologies to meet the needs of the customer. These products are then produced by a specialized production team with close ties to the engineering group, ensuring the product is of high quality and helping keep the cost at acceptable levels. A savvy and experienced sales force then pushes these products into the market, creating demand for the innovative solutions. This effort is assisted by the Finance team through a leasing program that removes the barriers to acquisition for many customers, especially the smaller ones. Finally, the products are kept running and in tip-top shape by a service organization, well trained by the Product Training Group in technical troubleshooting on all the products, and dedicated to getting the equipment up by whatever means necessary.

This chain of value-generating activities ensures customers get the best solution for their problem, that it is available to them and configured properly for their unique needs, and that it works when they need it to work. This is the value Creo brings.
3 ANALYSIS OF INTERNAL STRATEGIC FIT

This chapter will analyze in greater detail Creo’s general strategy when approaching the graphic arts market. Certain strategies require certain operation traits and this analysis will show how well Creo is structure to deliver its strategy. Finally, a more detailed examination of Creo’s financial statements will provide another view into the company and provide some hints on how it can improve.

3.1 Current Strategic Fit

As described in chapter one, Creo is in the business of providing sophisticated and mission-critical equipment to printers. It is a pure business-to-business company with no consumer or retail products. Its general strategy is to provide a very technically-differentiated product bundle to achieve high margins, profitability and growth. Creo has a stated goal of being an industry leader in terms of technology and solutions, and wants to continue improving and changing the way printers do business. Until presses themselves become digital in nature and the prepress process is further streamlined, Creo is positioned to provide all the equipment and software needed in a print shop upstream of the actual press.

Creo generally attacks the market as the premium provider of all-things prepress. One of the favourite sayings of the top management team is “unique, sustainable differentiation”. As described previously, in its quest for this differentiation Creo has developed a top notch engineering team in many disciplines ranging from optics to chemistry to software.

However, the last few years have also seen a shift in strategy for the company. Whether it is the result of the dramatic growth, the lack of a Creo consumable revenue stream, the merger, market saturation or a combination of these influences, Creo has shifted its focus to include being the low cost provider of CTP equipment. The industry is more competitive these days and less willing to pay for the quality Creo provides.

This chapter will analyze Creo to see if its overall differentiation strategy fits with its variety of functional strategies. The actual stated strategy of the company is ill defined, consisting mostly of vague “feel-good” statements. This strategy boils down to trying to be all things to all people, but is highlighted with a reliance on older but still superior imaging technology, digitization of the entire prepress process from creation to print, and the addition of differentiated consumables with which to bundle device and software sales.
Creo’s actual behaviour will be evaluated against the stated strategy using the Strategic Fit matrix below, Table 1. The matrix shows how Creo actually ranks in each category, which will highlight inconsistencies and gaps in the strategic fit.

Table 1 - Strategic Fit Analysis for Creo

3.1.1 Product Strategy

Creo aims to put products into the market with features and capabilities that no other competitor is able to offer. It literally drove the printing industry into a new and better way of operating. This started with a suite of CTP machines that changed the way printing plates were made. Then the focus shifted to software, providing workflow management tools that organized and streamlined the printer’s operation. That software focus continues with additional tools to digitize the entire print production process, from design to bindery. This focus includes standards and infrastructure that will enable the automation of almost every step of the process after content creation. Jobs can be tendered for quote, orders input, supply quantities determined and jobs queued electronically. Editing and proofing can even be done via web tools.

Additionally, a lot of attention has been placed on how information is structured on the plates. This information structure technology is called screening, and changing the structures provides enhanced stability in the printing process while also dramatically improving the image

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18 Adapted from Bukszar, 2004 Class Notes
quality. Another benefit of innovation in this area is the ability to achieve a wider color gamut with normal ink mixtures, further simplifying printing while also improving quality.

More recently, these core strategies have drifted away from the innovation front, especially with respect to Creo’s imaging devices. Improved automation and throughput have been the focus and Creo has engaged in a specification battle with its competitors. The Thermal imaging differentiation still remains, but may lack some credibility and does not prove as effective in the face of a maturing, more price sensitive market. Differentiation on the software front continues to succeed, especially the inter-connection initiatives. Screening strategies have been gaining momentum and are used as a benefit that is enabled by Creo’s high quality, precision machinery. This is a benefit that its competitors cannot achieve because they lack the precision imaging capabilities.

Finally, Creo has recently filled out its product offering by producing its own printing plate. This plate is positioned as a high quality plate with acceptable cost per plate, and, so far, this has been relatively successful.

3.1.2 R&D Expenses

Creo has invested an average of 13% of its total revenue on R&D over the past four years. This is a relatively high amount for a manufacturing company to invest, but this level of investment indicates that Creo is serious about differentiating itself via innovative products.

Both R&D centers are located in countries that incent corporations to invest heavily in R&D: the Canadian Scientific Research and Experimental Development (SR&ED) Tax Credit program is a yearly ritual for the project teams at Creo; the Israeli Chief Scientist program plays a similar role for the Herzlia teams. Both of these programs make the R&D expenditure much less costly than it would be otherwise. Additionally, the cost of R&D in Canada is low in comparison to R&D in the US, Japan or Europe. The lower Canadian dollar, coupled with lower salaries in Canada, makes it an excellent place to locate an R&D center.

Even without these programs though, Creo’s management team would invest heavily in R&D. A love of technology is at the core of its culture and believes that it is through technology that it can succeed. This belief, coupled with the relatively low cost of R&D for the company, gives it a definite advantage in this area.
3.1.3 **Structure**

Creo’s structure was very de-centralized by tradition, but the turmoil of the merger coupled with influences of the other organizations has caused it to shift to a more centralized schema. The decision making and alignment of the company deteriorated in the wake of the merger as people dealt with new people, products and emotions. The management team needed to make changes in a variety of remote roles and draw back some of the autonomy of the regions to ensure Creo got back on track. Financial hiccups have also caused the company to centralize many functional areas in an attempt to achieve efficiencies. Product and Service teams used to have functional representatives, but these have been rationalized in multiple rounds of cut-backs. This more and more centralized strategy does not fit well with the overall differentiation strategy as differentiation requires the greater flexibility a less centralized organization provides.

3.1.4 **Decision Making**

One of the core cultural tenets of Creo is “unit-presidency”. This simple phrase is used to convey the concept of individual authority, responsibility and autonomous decision making that was important to Creo’s survival before its rapid growth spurt in 1998 and 1999. This philosophy was crucial in giving Creo the adaptability and flexibility it needed to survive in a market of giant plate manufacturers who had deep pockets. Every individual was expected to understand the big picture and do what they thought was best to achieve success. Roles were more loosely defined and often adapted to an individual’s strengths and weaknesses.

This level of autonomy began to breakdown during the rapid growth years. As the company grew it became much more difficult for any individual to be able to both focus on the details of his or her job and keep the bigger perspective that allows effective decision making for the company as a whole. As a result of this, autonomous decision making was less effective and managers throughout the company had to take on more responsibility for decision making.

From an organization theory perspective, it is not clear that this is not an inevitable result of rapid growth. The big picture is too abstract for every individual to grasp and remain focused on the details of their position. This causes roles to shift from decision maker to information consolidator/recommendation maker. This shift enables a more and more diverse set of activities to remain coordinated; however, it does lead to less flexibility and differentiation as more and more compromises are made to stay in line with the big picture.
3.1.5 Manufacturing

As a way to restore flagging profitability Creo has lately been pushing for major cost reductions in Operations. Without a consumable to bundle the machine with, Creo was often put in a price war. This situation has driven the company to strive to be the low cost provider, while also retaining the quality level to prevent brand dilution. Subsequently, the assembly of the devices has been broken down into sub-steps designed to reduce costs and increase throughput. This attempted low cost manufacturing strategy may put the company’s ability to differentiate at risk. By trying to do both Creo could find itself in a position here it is doing neither very well. The Lean Thinking initiative described previously is an attempt to guide this transition without sacrificing quality and differentiation. This may work, and it is possible that the Lean Thinking initiative will allow Creo to optimize its cost structure, but not truly transition to a low-cost provider strategy. So far, the quest for cost reduction has resulted in a slight degradation of components due to extensive subcontracting of work that was originally done in-house. Machine performance still meets specification, but the devices are not finished as well as they were before the work was sent to subcontractors.

Finally, the impact of this shift is unknown on the other main areas of Creo’s business. Software “manufacturing” does not degrade significantly with cost reductions, although server hardware setup and configuration may be impacted. The plate manufacturing facility is new to the company and it remains to be seen whether or not Creo is able to maintain quality standards in this area. The potential for this to be an issue is highlighted by the plates made at the recently acquired plate manufacturing facility in West Virginia. The plate emulsion coating can vary in thickness at the edges but the plate edges are not trimmed to eliminate this variation. This variation can cause plate alignment problems later in the printing process. The money saved by not trimming the plates results in a fairly significant quality risk.

3.1.6 Labour

The assembly of a variety of very complex electro-mechanical systems was originally the task of a small group of specialized engineers and technicians who could troubleshoot every part of the system as required while working the bugs out. In times of production crises every engineer and scientist would pitch in and help keep production operating. This amount of flexibility is costly, though. Initially, when the market was young and there was no competition, good margins could be retained. As competition has increased, so has price pressure, and, as a result, cost reductions have been sought. New production personnel hired into production are not
exposed to as broad a range of responsibilities, so are no longer able to develop as wide a range of skills as easily as they were able to in Creo’s past. Also, as the company and its products have matured, the engineers are not as involved in day to day production activities. The engineers are not as able to step in for production people in times of crisis. The production and engineering teams are still very skilled and flexible, but less than they used to be and that skill and flexibility is no longer demanded as much.

The exception is in the manufacture of lasers. Since the lasers are still the core of Creo’s differentiation, the production of the laser still retains a significant amount of mystique. The laser production team is one of the last teams that retain much of the old Creo feeling, and is a group that is most steeped in the legend and lore of the company. It is still a very demanding job and has stayed largely the same for the past nine years. The assembly of subcomponents has been streamlined and optimized, but the laser production team is still highly respected for their skill level.

All in all, the labour force retains much of its flexibility and can be shifted from one product line to another as demand shifts. Small device, large device, proofers, or flexographic engines, the device production team can handle them all.

3.1.7 Marketing

The complexity of the products offered, the scale of purchase these devices entail, and the high profile printers that were the early adopters of the technology all demand a costly direct sales force. These are long lead sales, which must be groomed carefully by experienced and knowledgeable sales people. It is a very consultative process in which the sales person basically convinces the buyer to adopt an entirely new way of doing business. This type of channel suits the high margin, highly differentiated product but starts to breakdown when the product portfolio gets too large and when the attention is shifted down market, where margins are too low to sustain the expense of a direct sales force.

Coupling this potential shift to the broad market with the loss of focus on differentiation in Creo’s product portfolio, this direct sales channel has not been leveraged as well as it could have been over the last couple years.

The major marketing activity that goes along with this direct sales model is a strong presence at all the major trade shows. These shows provide an excellent forum in which to close deals and develop new leads. With the shift in focus down market Creo has started advertising
more, with most of the advertising being geared towards increasing brand awareness rather than pitching a sale.

Overall, the marketing of the company is well suited to the direct sales model Creo used in the past, but the company is trying to use this sales force and marketing technique down market where it is less effective. Some realignment needs to happen in this area to improve the effectiveness of the channel or adapt its structure to Creo's area of focus into the future.

3.1.8 Risk Profile

Early in its life Creo had a high risk profile - it would tackle new markets with revolutionary products and largely be gambling the success of the company on those efforts. In a sense it was all or nothing. With the success of Thermal CTP Creo established a base on which to really grow and has focused on expanding within the confines of the graphic arts industry. The last several big and risky efforts have all arguably been unsuccessful. The merger was not as successful as was hoped and did not seem to bring the anticipated gains. The move into e-commerce and printing ERP systems with PrintCafe turned into a poor investment. A small attempt to enter the telecom market was an interesting and technically successful feat, but came too late to capitalize on the market's enthusiasm, resulting in the technology being shelved.

These failures have made Creo's management more cautious. There is more talk of farming the existing install base and less focus on dramatic growth opportunities. The one major exception to this is the entry in the printing consumables market. This has involved the acquisition of manufacturing facilities as well as the establishment of extensive logistics channels, and was a major stretch for Creo. This risk was a strategic necessity, though, as it has been apparent over the last several years that Creo could not remain competitive without its own consumable to bundle with its CTP machines. The long term revenue stream this option gave Creo's competition allowed them to finance sales with the consumables revenue stream and win the sales via machine price every time.

Beyond this strategic necessity, Creo has definitely shifted to a more cautious operating stance. This caution pervades all aspects of business, from purchasing to hiring to product development. There is little room for failure right now, and the position of having a significant amount to lose coupled with the last years' difficulties has slowed Creo down a step. Daring and energy must return to the company or it will face a different kind of failure because the low risk approach does not fit well with the differentiating strategy.
3.1.9 Capital Structure

Creo has a very conservative and healthy capital structure. While it is not generating very impressive revenue, the company has above-average liquidity and very little debt. This conservative financial position has enabled Creo to weather a soft market without being saddled with large interest obligations. This has in turn allowed the company to continue to spend in areas of long term benefit like R&D, rather than pay off loans. This conservative position is well suited to a differentiation strategy, but if the intention is to continue to shift the company down market, more leverage positions may be appropriate as this kind of financing is less expensive than equity. The reduced expense would help Creo move into a low cost provider strategy.

3.1.10 Summary of Strategic Fit

Overall, Creo’s behaviour is consistent with the stated and historical goals of the company, but there is potentially a problem with those stated goals. The company is striving to become the high quality/low cost provider and take the entire industry. However, this is being done in a somewhat simplistic way that does not seem to recognize the difficulty of achieving this strategic position. The examples of success with this strategy are usually the result of learning curve effects over time. In this case, Creo is attempting to do this without having fully traversed that learning curve. Also, success with a low cost strategy is dependent on achieving the volume of sales necessary to take advantage of any economies of scale to be found in the industry. The economies need to be leveraged in the manufacturing process via volume discounts and streamlined processes, in the sales process through efficient identification of buyers and account coverage, and in the service organization via remote resolution of equipment problems. It may not be possible for Creo to capture enough of the market to achieve any economies of scale in its processes, especially manufacturing. Because of these issues the efforts towards a low cost provider strategy may put the company in the middle ground, and unable to create a strong position either way. Much of the motivation for these efforts stems simplistically from Creo’s desire to improve profitability by cutting costs. Seemingly unable to create revenue growth and being faced with eroding differentiation and profit margins, Creo is casting about to find a way to improve its earnings. The only part of the equation left is cost cutting. The drive to improve profitability is due to severepress ure from the market in the form of continually low share prices over that last several; years.

The strategic fit chart (see Table 1) clearly shows a company that is confused about how to succeed and is trying to do it all without understanding the implications. Creo’s management
should focus on making clearer strategic decisions and then focusing on the activities required to support whatever strategy is chosen. If it decides to continue with the differentiated strategy that it already knows well, it should let the learning curve effects eventually provide the benefits of the cost-based strategy. Otherwise Creo faces the serious danger of becoming stuck in the middle with no clear path to excellence in either strategy. Creo will find that it has lost the ability to innovate and lacks products and insight to achieve the efficiencies required of the low-cost provider approach. This lack of focus must be addressed soon.

### 3.2 Financial Analysis

This section will review Creo’s balance sheet, income statement, and statement of cash flows. The values will be used to conduct a general ratio analysis of the company over the past three years. The trends of the ratios will also be examined to provide insight into the health of the company into the future. The following table is a summary of the results of the analysis and several graphs of the ratios over the last three years are presented in Appendix A.

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Table 2 - Financial Ratio Analysis for Creo

#### 3.2.1 Operational Ratios

Creo’s operational ratios show a good level of liquidity. Creo has continually managed its cash flow well so is quite able to meet its obligations and operational expenses. The company is quite financially healthy on its balance sheet, but the issues facing the company show up on the income statement. The liquidity of the company is show by both the Current and Quick Ratio.
The Current Ratio averages about 1.8 over the last 3 years. The recent increase to a level over 2 is due to the additional capital Creo raised in the spring via an issue of shares. Creo will need to utilize this capital as the cash will otherwise lay idle and suggest slight mismanagement. The Inventory Turns ratio could be better at an average of 0.84 for the last 3 years, but this is not outside the industry norm so does not deserve any significant attention. The Collection Period is in line with the industry at about 80 days and is even declining.

Analysis of the company’s margins gives some insight into where Creo could potentially make some improvements to its profitability. First, the CGS/Sales ratio shows that the raw gross margins are lower than would be desired. This is mostly due to the fact that the discount rate on sales is too high on average, directly reducing Creo’s revenue. The high discount rate necessary to close the deals is a consequence of the prior lack of a consumables offering with which to bundle other sales. The product cost structures could be lower, but Creo’s parts costs are actually quite competitive and any cost reduction that is done there would be pushing the industry norm. Another pressing issue is the level of the Admin/Sales ratio. G&A expenses, including Sales and Marketing costs, and R&D expenditures are high for the level of sales Creo is generating. This ratio shows the lack of fiscal discipline that has plagued the company since going public as well as the high expense of the direct channel. The G&A costs have been improved, but Creo has found it difficult to make the decision to shed any R&D activities and reduce this ratio to more reasonable levels. This needs to be considered seriously in a market that is approaching saturation. Creo has to ask itself whether the market supports that level of R&D investment.

The low Profit/Sales ratio goes a long way to explain the low share price that has plagued the company. The large dip in profitability in September of 2001 was due to a one-time write down of the goodwill from the merger with Scitex. Excluding that the average profitability of the company has been around -3.5% and the resulting low share price is not surprise. There is a hint of an upward trend in profitability reflecting the improving economy and the impact of the increased discipline of the company. However, these hints are not enough to quell the rumors of potential takeovers. Since the share price dropped, Creo has been concerned about being a takeover target. The company is vulnerable to being bought for a relatively low price and then drained of all its future potential. More specifically, another company could take Creo over, shed all of the R&D and other “unnecessary” expenses, immediately improving earnings, and simply reap the profits on remaining sales into the future. Assuming every R&D dollar was sent
directly to earnings, it would not take long to pay for a controlling interest in the company. This is another way the low share price applies incredible pressure on the management.

One popular way to evaluate the overall performance of a company is the value Return on Equity (ROE). ROE is calculated by dividing a company's net income by the amount of equity the shareholder's have\(^\text{19}\). ROE can be broken down into three principle components: profit margin, asset turnover and financial leverage that can help focus any analysis on how to improve a company's returns. Analysis of profit margin has already shown that Creo has lower than desired return on sales, but breaking out the Asset Turnover component shows that each dollar of assets are not generating sufficient sales to compensate for the low profit margin. Asset Turnover for Creo has been, on average, 0.28. The low ratio here suggests that the Intangible Assets are being overvalued as they are not generating more sales, and might also indicate that the manufacturing facilities are not operating at sufficient capacity. Creo’s Financial Leverage position is quite reasonable for a company of its type, but it is not compatible with the Profit Margin and Asset Turnover (which, when multiplied, become Return on Assets, ROA) levels from which the company has not been able to get away. To provide returns to shareholders without leverage the company, it must be able to operate very profitably. Creo needs to both increase sales and control or even reduce expenses, and restore its profitability before it can afford to operate with such low debt levels.

As alluded to above, ROE and ROA are well below levels desired by both Creo’s management and the shareholders. Over the last three years they have both average around -1%. Trend analysis does show them both on an upward trend of approximately 2% per year. If stable this trend would project ROE to be on the order of 8% by 2007. As the Long Term Liabilities are not significant in magnitude, the ROIC value is not that different from ROE. If this similarity of value also stays the same, Creo will fall short of its 2007 goal of 20% ROIC.

On a final note it is worth looking at a couple additional financial metrics in order to more fully understand Creo’s financial position. Creo has never paid out a dividend so its Payout Ratio is zero. Since profitability is so low at this time, it does not seem that dividends are likely to be paid out in the near future. A more interesting metric to analyze is the Price to Earnings ratio (P/E) for Creo. The value over that last twelve quarters has varied widely, probably due to an artifact of the calculation. Earnings have been very small, so would cause big changes in the resulting value when divided into the price. More interestingly though, the P/E shows an

\(^{19}\) Higgins, Robert C. *Analysis for Financial Management*. 6\(^{\text{th}}\) ed. (Irwin/McGraw-Hill, 2001), 68
increasing trend that may indicate the market is becoming more optimistic about the future of the company. As returns have crept up, and operational metrics have improved slightly the P/E has gone up as well. A lot of improvement still needs to be made, but the picture that is revealed by the above analysis shows Creo has the potential for a strong future.
4 CHALLENGES

Creo faces a number of significant challenges as it moves into the future. The graphic arts industry is evolving as CTP technology matures. As the blush of the revolutionary technology wears off, there is great pressure to find out what is next as well as to learn how to best utilize the capabilities at hand. Some of the challenges also revolve around more basic business principles, but the first step to dealing with anything is recognizing it. The purpose of this chapter is to describe the most pressing issues facing the company, and to aid in forming a cohesive set of strategic recommendations to guide the company into the future.

4.1 Low Share Price

Since the “Dot Com” meltdown in 2000 Creo has been struggling to restore a flagging share price. R&D expenses have been growing as have G&A, but without a commensurate increase in sales, the result is poor profitability. This low profitability, coupled with suspicion in the market about the company’s ability to return to growth and profitability, has caused the market value of Creo to continue to slide from an all time high of $55 CAD to the current value of approximately $10 CAD. This flagging share price impacts the company on a number of levels; first, the downward trend of value causes the investors and board of directors to increase their attention and pressure on the management of the company. More and more, Creo faces additional scrutiny about the decisions it makes. This scrutiny is causing the decision making of the company to be more focused on short term results to help bolster the capitalization and prevent further erosion of shareholder investment.

Second, the flagging share price has increased the risk of loss and replacement of our current, friendly, shareholder base. The risk of a takeover by one of several hostile competitors has been a clear worry of the management team. They do have a clear vision of where they want to take the company, and have no desire to abandon control, and so far the shareholders agree that the current management is best equipped to leverage the assets of the company into shareholder value. Many are concerned about a takeover because they feel it would destroy the culture of the company and dilute the focused value proposition that the current strategy is supposed to provide.

Finally, the share value has long been an important component of the Creo compensation package. There has been a distinct drop in morale over the last several years that is partially due to the seemingly dwindling prospect of substantial payback from the options that Creo has
allocated. The option portion of an individual’s compensation package was contribution based, where contribution is a product of the leverage of one’s role and one’s performance in that role. The potential gain from options was once quite substantial, but the general consensus among employees now is that they are worthless. This is important because it was the justification for asking the employees to put in prodigious hours to accomplish project milestones or service a customer. Without the dangling carrot there is definitely less willingness to focus solely on the needs of Creo to the exclusion of personal issues.

While Creo has not been doing well by any objective financial measure over the past several years, it has been doing better than many, if not all of its competitors. However, the market as a whole does not seem to credit Creo with the potential it has. This may be due in part to a loss of credibility due to several missteps since going public. While one can never know with certainty what would have happened if another choice was made, there is a subtle undercurrent of opinion that believes the merger of the Scitex Prepress business in 2000 was unnecessary and a mistake. None of the goodwill or stated synergy was ever achieved. In fact, the goodwill was written off as a one time loss soon after the merger. A number of senior management had to be replaced, and there is still a persistent problem of sales and service teams that are less effective than desired.

After the merger decision was made, Creo (then CreoScitex) ventured into the world of internet start-ups, getting caught up in the hype and attempting to gain capital. Creo invested heavily into a company called PrintCafe, whose product suite consisted of a variety of software offerings that purportedly enabled online print sourcing and supply ordering. The IPO came too late, well after the bubble burst, so Creo was unable to capitalize on the frenzy and obtain the desired additional capital. In actuality the investment cost Creo significantly. The last throws of the relationship between the companies involved Machiavellian investment banking tactics (including poison pills) and resulted in PrintCafe selling itself to one of Creo’s major competitors, EFI. Creo embarked on this venture knowing full well that the Dot Com craze was irrational and unsustainable, but still committed scarce resources. The decision was based on the idea that the potential upside was so large that it was worth the risk. Another element of the rationale was that PrintCafe’s product suite fit in nicely with CreoScitex’s Network Graphic Production vision. Despite the rationality behind the risk, after observing the results of the venture the market seemed to lose some faith in Creo’s leadership.

This loss of faith or credibility was then compounded by poor financial results that were due largely to the poor economic environment. However, Creo’s spending was not immediately
curtailed in the face of the economic downturn, adding an additional aggravating factor to already troubled financial circumstances. The market saw declining revenue (due to the economy) and growing R&D, G&A and operational expenses (due to a lag in instilling the necessary discipline) and lost further confidence in Creo’s viability into the future.

Now, Creo has embarked on a new strategic initiative, Digital Media. In the last year the company has entered the realm of Kodak, Agfa and Fuji by producing its own thermal digital printing plates. Consumables expenditures are approximately twice that of software and hardware, and becoming a consumables provider approximately doubles the total market, from $2 billion to approximately $4 billion, addressable by Creo products. In actuality this is not that new of an initiative, the company has been working on it internally for the last 4 or 5 years. The work has consisted of developing partnership deals, and then building its own product development team and sourcing manufacturing and distribution capabilities. The huge amount of work has not yet brought in the returns, but it is perhaps too early to pass judgement - the market is certainly waiting for tangible proof. No credit or creditability was gained for embarking on the thermal consumables strategy. It is as if the market does not believe any of the promises, but is waiting to see revenue and profitability increase. This seems to imply scepticism about the company’s ability to execute its plans. The plans and ideas are compelling, but worth nothing if they are just words and concepts. Thermal consumables may be thought of as another poorly considered merger or internet start-up investment. Especially since a considerable part of the consumables business is concerned with reliable, timely delivery of a consistent, quality product. Success with consumable would show the ability to execute, failure would simply reinforce the idea that Creo management cannot deliver on its promises.

4.2 Market Focus

One question that has been plaguing Creo strategists for quite some time has been whether to try to stay with a high quality, high margin model at the top end of the market or shift to the broad printing market, bringing low cost, adequate quality CTP equipment to the smaller printers of the world. Creo knows very well that it is not organized to efficiently serve the lower end of the market. Major structural changes would need to be made to the sales and service organizations and the product development teams would have to revise their prioritization of the requirements lists.

The broad market is such that Creo continues to question whether or not it would be very profitable. The offset printing process is still lacking in robustness. Parts of the system can be
finicky and may require significant attention to keep the performance at an adequate level. This level of attention is expensive, but it is clear that the broad market will not accept that level of expense - less costly systems need to be developed. Currently, Creo can maintain their products profitably because the larger commercial printer is willing and able to purchase service contracts which are priced as a percentage of the equipment they cover; the larger the printer, the larger the purchase, the larger the service contract revenue. The smaller printers in the broad market purchase less equipment and are also less willing to pay for service contracts. Now that Creo possesses product development capabilities in every area of prepress, it is better prepared to construct an entire system that could be better suited to the broad market and truly provide unattended operation. The question remains, though, regarding whether or not this is a profitable market.

The somewhat ironic aspect of the problem of moving down-market is that Creo’s SQUAREspot™ truly does stabilize a major portion of the printing process, which is of great potential benefit to any size printer. Creo is perceived as the Mercedes of the prepress world, an expensive luxury. In actuality, the value Creo’s technology brings is much more utilitarian. It will actually give you less trouble and variability, despite the precision. This stability can be leveraged to produce high quality print that is virtually indistinguishable from photographs, but it will also simply provide better color stability during a long press run on single color print work. The control the imaging system provides can be leveraged in many kinds of print job.

The other major concern is that the broad market is more price sensitive, and competition is likely to degenerate into price wars. Competing in this manner impairs profitability and would require the cost of sales and services to drop dramatically and require a big change in Creo’s manufacturing cost structure. This is where the precision of Creo’s imaging technology seems somewhat incompatible with the broad printing market. The precision does come at a higher cost. Competing on this level could mean abandoning the SQUAREspot technology for something less costly to produce. This would complete the market degeneration as all technology differentiation would disappear and customers would be getting the lowest cost product with no real difference in value.

These two factors together create something of a conundrum; printers expect a robust system that makes their work easier, yet are only willing to pay for the less stable technologies. Creo’s job is to make them understand the true value of the SQUAREspot imaging technology or figure out how to manufacture that technology at the same cost as its competitors. To this end Creo was considering the idea of outsourcing certain portions of its manufacturing to China to
reduce the cost of the products. Only the engine manufacturing was being considered for outsourcing, as the bulk of Creo’s product differentiation lies in the imaging head and there was a lot of concern about losing control of intellectual property once the company sent the product out for manufacture. Outsourcing has a variety of risks inherent in it, and it was considered carefully. The prime concern was the loss of quality control. This would have been especially damaging to Creo, as it is a company whose reputation was built on the perception of very high quality products. Another benefit of these outsourcing efforts would be facilitation of further entry into the potentially large Chinese market, but Creo decided in the end not to pursue off-shore manufacturing as much of the cost reductions available would have been lost with extra shipping costs.

Another issue about moving down-market is that much of the talk of the broad market is about violet CTP rather than thermal CTP. Violet CTP does not provide the binary nature of thermal imaging, which is crucial to process control and stability, but there still seems to be significant momentum building behind violet technology, mostly because it requires simpler and less costly machine architecture. Creo keeps its eye on all competing technologies, but if a technology shift was necessary it would require major adjustments in many parts of the company, from Product Development to Marketing to Service.

The momentum of violet illustrates a continued obstacle to Creo’s success with their marketing efforts. Although the benefits of thermal technology are easy to describe, there seems to be a reluctance to accept the message from the market at large. If you bring a customer in and walk them through the concept, they understand it completely, but in a general case there is a lot of scepticism about the message. Non-technical industry analysts denigrate thermal as old news. Perhaps this is just the media trying to stir up their audience, but it is persistent enough to create a shade of concern and doubt within our engineering groups. It should also be a concern for the marketing group as it does not bode well for any kind of marketing campaign targeted at the broad market. Creo needs to reduce the cost of sales for the lower end of the market and this definitely precludes bringing each and every small printer in to explain the thermal technological advantage.

Work in the broad market may require a significantly different way of thinking. Creo would need to re-evaluate the entire printing process with a different set of criteria in mind. Designs must be done differently, manufacturing focused on different issues, the sales force would be composed of very different elements and even payments might be made differently. The entire market requires a new set of skills and abilities. If the decision by management is that
it is a good opportunity, how does Creo acquire the necessary skills and knowledge to be the best in the broad market? Does it keep the current teams and just clearly redefine their priorities? Or does it let them all go and rehire a completely separate team of individuals with skills and experience more applicable to the small printer portion of the graphic arts market? One potential answer to these questions will be provided in chapter five

4.3 Supply Chain and Intellectual Property

One thing that has impeded Creo from lowering the cost of its imaging systems is that it single-sources several key and expensive components of their imaging systems. This is recognized as a weakness, but no effective remedy for the situation has been found. Without any competition the suppliers are able to extract monopoly prices from Creo.

In one case, there have been extensive efforts to find additional vendors for the last 8 years, but it is only recently that one has showed any promise. The difficulty lies in the performance specifications required in the system. It seems very difficult for most vendors to achieve the required specifications consistently. Even the existing supplier has trouble maintaining the necessary quality, which directly impacts Creo’s ability to maintain the quality of its systems. Because of this the production team is too often faced with the choice of whether to ship a borderline product or not ship at all - this is obviously not the best situation for a manufacturing company. Providing the process control and stability requires the technology to push current performance limits, which generally implies higher cost. However, since there is difficulty in maintaining the differentiation because the market has not fully accepted the value of Creo’s technology, Creo cannot afford to pay much extra to fund the enhancement of vendor capabilities and help create a more reliable supply base of the crucial system components. This has left Creo in the position of being vulnerable to the output variation of their vendor.

In another case, concerns about protecting intellectual property have prevented wider sourcing of the specific component. A significant portion of Creo’s differentiation lies in the use of this specific component and the more sources Creo cultivates, the more likely a competitor would gain access to the component and its capabilities. Creo had to work closely with its current vendor to refine the manufacturing process of the component to meet the performance specifications, and the sensitive information lies in the process refinement and the performance specification. Stabilizing the component so that it is useful in graphic arts has eluded other companies and prevented Creo’s competitors from using similar technologies. This is a double-edged sword in that it is beneficial from a differentiating perspective, but deleterious from a cost
perspective. The cost impact is due to two influences: the first is that Creo is unable to buy from multiple sources so has little negotiating power; the second is that the market for these components does not have any kind of competition pushing it to provide a better product for less, and is not likely to achieve any kind of economies of scale with Creo as the sole customer.

Recently, there has been a growing sense of dissatisfaction with the above vendor. The monopoly power being wielded is too strong and it seems to be losing their edge without any competitive pressure. Creo is starting to feel that it needs to incur the intellectual property risk to at least qualify a second source of components. It might be possible to maintain a strong control of the intellectual property by segmenting the supply chain of the component. It currently consists of only two steps, raw material production and processing and assembly. Creo can perhaps break this into three distinct steps, and still hopefully not incur too much of a yield and transportation cost penalty. The trade-off should still be beneficial because it introduces competition and eliminates the monopolistic behaviour of the current vendor.

4.4 Culture and Product Development

When it merged with the Scitex prepress assets, Creo gained a product development center in Israel and also more than doubled the size of the organization. These had both positive and negative impacts on the company as a whole. Creo has pushed through many of the difficulties of the merger, but some persist because of the nature of the problem rather than because they are the result of the merger.

Coordinating product development across multiple sites is not ideal. The benefits of being able to easily walk down the hall and discuss a technical design issue are tremendous. Face-to-face contact is the highest quality way of communicating and this can be crucial when dealing with complex systems and making delicate tradeoffs in the design process. Even prior to the merger Creo had some exposure to this challenge when two of the complementing product groups were located in different buildings - merely being across the street impedes different parts of the team from working together.

This difficulty is compounded by an order of magnitude when there are product development teams that have to work together across an ocean with ten hours time difference. This difficulty is compounded even more when the engineers in each team come from radically different design philosophy backgrounds. All these issues can slow and corrupt the development process unless the potential for problems is dealt with up front and monitored continuously during the engineering cycle. Creo has recognized these difficulties, but is unfortunately
restrained in utilizing the best mitigating technique: travel. Travel expenses have become a point of serious concern for Creo, and all travel is scrutinized closely. Unchecked, travel costs grew rampantly, and Creo is in the midst of the introduction of spending discipline. It takes keen judgement to know accurately when face-to-face meetings are necessary as compared to video- or teleconferencing.

The scrutiny and discipline required to control travel costs is a good example of the change in environment that the typical Creoite responds to with a grimace. As the company became successful in the latter half of the 1990’s and grew rapidly, there was amazing opportunity for the self-management and unit presidency concepts to flourish. There was also a general obscuring of the overall picture of the company and a loss of ability to make balanced judgements as a unit president. The company just got too big for an individual to know whether he or she was making the optimal decision overall at a given time without the perspective of someone with a broader view of the organization. This was aggravated considerably by the merger, which doubled the size of the organization.

Now, Creo is a “big company” that “has lost touch with its values”, to paraphrase somewhat typical hallway comments. Many of the employees who have been with the company for a longer period of time are not entirely happy with the changes they perceive. Issues such as controlling travel costs and instilling clear processes to facilitate cross-continental product development have created the perception in some that the company is just becoming a large, bureaucratic, and indifferent organization that has lost the spark that made it special. This kind of view is most often heard coming from long time employees who started when the company was much smaller. The unfortunate corollary is that these people are also often very talented and experienced so their opinion carries a lot of weight with other employees. It is not clear whether the more senior employees are stating an accurate assessment of Creo, or whether it is just discomfort about the changes that are necessary. The company is undoubtedly different. But a public company of the size and scope of Creo does require some process to help maintain the required performance necessary to provide returns to shareholders and service to customers. The changes are partly the inevitable shift from being a start-up company to a mature industry leader. The past is often seen through rose-tinted glasses and the good things in the present and future are ignored when comparing them with past circumstances.

Part of the difficulty in appreciating the current state of the company is definitely due to the consequences of the economic slowdown. Creo’s major growth phase coincided with an incredible stretch of economic prosperity and growth for North America. When the entire world
slowed down after the Dot Com crash, it was a figurative slap in the face to the entire company. It had been on a roll; the company had gone public, it had merged with their competitor, the stock price was at an all time high, and then it all tumbled down. Hard earned options have been worthless for several years, and many were lost when they expired while still underwater. On top of this loss of expected riches, employees have watched their friends lose their jobs in several rounds of lay-offs made necessary by Creo’s poor financial results in the last several years. A relatively young company, Creo had never needed to do lay-offs prior to their first set in 2001. These were not handled as smoothly as they could have been, so they generated a fair amount of resentment. Management lost the trust of their employees, and has been struggling to regain credibility ever since. Altogether, morale at Creo is not particularly high. There is very little sense of excitement and hardly any sense of loyalty and passion. People come to work because it is a steady, reasonably well paying job with a relatively stable company. Like the shareholders, Creo’s employees are waiting for a reason to start to believe in the management team again. Likely this will only be if and when the current strategies start to pay off and the company starts doing well financially.

4.5 Opportunities

Creo has a variety of strategic initiatives in place to continue to grow the company. These are consolidated under the name Destination 2007, which is a commitment to the board and shareholders to meet certain profitability targets, revenue targets, market share targets and internal success metric targets like employee satisfaction. Creo is aiming to be a $1 billion dollar company by 2007, which would require approximately 20% growth per year of revenue for the next three years. A more difficult question is: how will Creo grow from a $1 billion company to a $10 billion company. There seems to be a lack of longer term vision. Perhaps the management team is simply trying to keep people focused on becoming a healthy, financially viable company again and not worry about more distant objectives, although this may instil a cultural short-sightedness. Becoming public definitely has changed the decision making process at Creo. Previously there were very clear criteria based solely on net present value (NPV), but less patient shareholders also want to see short term profitability. So, although Creo has projects that are estimated to show a strong positive return, it is unable to launch them due to an R&D spending cap. This could be considered fiscally wise, as unrestrained investment, as well as many other unrestrained behaviours, could drive a business under. However, failing to pursue good
opportunities when they are presented can also indicate that a company has lost the edge needed to achieve success.

Creo's Destination 2007 initiative is built on 4 strategic pillars: Networked Graphics Production (NGP), Digital Media, Value in Print (ViP), and Certified Color. Beyond these, there are several other opportunities that the company is pursuing with varying degrees of vigour. Some are active, but not thought to be long term growth opportunities; some are highly speculative, but have the potential to change printing fundamentally.

4.5.1 Network Graphic Production

NGP was originally a Creo product suite concept. All Creo software was supposed to link together to provide seamless links between the creative aspects of graphic arts and the purchasing of the raw materials. This focus has evolved into a Creo-led standards initiative and industry working group that is defining the details of the Job Definition Format (JDF), a set of XML file formats for print jobs that will contain all the information necessary to complete a print job including paper type, ink color, and bindery settings. This shift seems to have been a wise one from a PR and marketing perspective as Creo is viewed as the industry leader of this initiative. Competitors have announced the launch of copycat efforts, but none have the momentum or wide backing throughout the graphic arts world.

The difficulty of the standards strategy is that there is not an obvious way to capitalize on the efforts financially. Being close to the standards setting will allow Creo to develop more competitive products within the standard, and perhaps get a jump start on new products that support the full JDF format, but Creo's idea and vision has been shared with the world with no compensation otherwise. Strategically, changing the competitive landscape by adding a new requirement is a powerful gambit, but only time will tell how much revenue this strategy will generate. As it is now, it does not seem NGP will provide tremendous growth opportunities to take the company to $1 billion in revenue and beyond.

4.5.2 Digital Media (Consumables)

Becoming a plate manufacturer may be the second most defining moment in Creo's history (after introducing thermal CTP). For the past several years Creo has fought a valiant, but highly disadvantaged battle against other CTP providers who were able to finance the CTP purchases for their customers with long term media contracts. Without this as a tool, Creo had to struggle for each and every sale. While being a consumables provider will enable more CTP
sales, it does carry very heavy expectations with it. Creo must learn to provide a reliable stream of high quality product without making any mistakes. The company does not have any room to learn through missteps, as it is under the intense scrutiny of their customers, competitors and shareholders. Expected revenues from the plates will exceed $350 million by 2007, which would put Creo over $1 billion in revenue when combined with anticipated growth in the other product lines.

The Digital Media component of Creo’s strategy doubles the total market size in which Creo operates. Annual sales of CTP equipment and software are approximately $2 billion per annum, with an additional $2 billion in sales of media. As described above, though, entry into the rest of the market via a plate offering was actually necessary for survival, as well as a growth strategy. Without the more stable revenue stream media provides and the flexible bundling opportunities it creates, Creo would not be able to compete effectively. The counterpoint to this view is that there may not be room for an additional consumables provider in the industry. More than one person on the management team believes that there will need to be some kind of consolidation or exit in the next several years. Creo, being the newest, is therefore also the most vulnerable financially, especially with its low share price. Aggressive efforts are being made to prevent Creo from getting pushed out or acquired.

4.5.3 ViP Consulting Services

Value in Print (ViP) is a combination technology and service product. The product side consists of a set of higher resolution stochastic printing patterns, Staccato™ Screens, which improve the stability and robustness of the printing process considerably. The benefits of these patterns are numerous, but they do not come without a price. They require more stable imaging technology to realize the on-press benefits. This marries nicely with the process control that Creo’s imaging technology provides. SQUAREspot is the foundation on which the value proposition of Staccato and ViP is built.

ViP is a consulting service that Creo provides to printers that covers a gamut of knowledge areas. There are several levels of service available, the first being Staccato Start-up Assistance. The second level of service is Staccato Optimization. The adoption of stochastic screens changes many of the subtleties of printing, and will not be successful if a printer tries to control the process the same way they control normal halftone printing. The ViP Service is actually an on-site education program that retrained the printer in this new way of printing. The
idea of stochastic printing is not new, but the benefits were never realizable before SQUAREspot technology was introduced.

The crucial weakness in this leg of Creo’s strategy is that this message implies Staccato is difficult. While not directly true, it is not entirely false. Staccato requires discipline and control, but the benefits are manifest. However, if one cannot impose the discipline and control required, and if a printer cannot let go of old techniques, then printing with Staccato will not achieve the results expected. Also, it is necessary to believe in the process control message of thermal SQUAREspot technology before one can believe in the benefits of Staccato printing. As described previously, this unfortunately eliminates some of the market. It is, in fact, misinterpreted as a flaw in Creo’s vision of graphic arts.

Finally, Creo only has a couple of employees who have the breadth of experience to conduct the Staccato Optimizing service. This level of knowledge encompasses every bit of the printing process and requires years of experience to diagnose a system gone awry. The problem Creo has is how to codify and make this knowledge transferable. The people who are currently the experts are probably not that interested in distributing their knowledge widely as it is what makes them valuable. The more they spread their knowledge the less valuable they are. ViP as a growth strategy is limited by the dissemination of this knowledge. Until Creo can figure out a way to transfer these skills and abilities to others easily, or to codify it in some kind of procedure or software tool, ViP will not be able to drive revenue growth for the company. It will remain a curiosity that distinguishes Creo from other companies, but it will not transform the world of graphic arts as Creo desires.

4.5.4 Ink Jet Printing

Creo also gained access to industry leading ink jet technology from the merger of Scitex’s prepress assets. The Ink Jet Printing Product Group has two main initiatives trying to leverage this technology.

The first lever being brought to bear is the new Veris desktop proofer. The Veris is an industry-leading technology in terms of speed, imaging quality and color reproduction. This product is intended to capture a significant portion of the proofing market for Creo, but while this would be nice is not the main thrust of the strategy. The Veris is being used to spearhead a color control initiative in the graphic arts industry. This strategy also has the potential to fundamentally change the playing field of the market, similar to the NGP initiative. Creo’s products will all work together well within the Creo Certified Color framework, but the stand-
alone product opportunities for this strategy are not significant; it is mostly a tonal calibration tool suite. While this alone will not generate tremendous revenue, the hope is that this kind of cross-product compatibility and consistency will be a big point of differentiation for Creo’s other equipment.

Veris is leveraging this differentiation even more by strictly controlling the ink and paper used to make a Veris Certified Proof. This certification gives Creo more control over another lucrative consumables stream. This idea could expand into Creo Certified Press Work, where only printed material made with Creo screens, in Creo’s calibrated workflow, on Creo’s SQUAREspot imaging system, using Creo’s plate media would be “certified”. This level of credibility would be wonderful for the company but is not that realistic. If the industry was driven in that direction Creo could begin charging other consumables and screen vendors to certify their products. This would trade competitive access for certification legitimacy, without which the entire initiative would dry up and disappear.

The other large initiative involves much more speculative technology. Very large inkjet arrays could someday entirely change how all printing is done. Creo is driving hard to become a leader in this technology arena. The benefits of going this direction are numerous because inkjet technology truly takes all other steps out of the process. Information is put directly onto paper with no intervening physical translation step. It also takes an entire class of consumables out of the process, completely eliminating the need for ink-carrying plates. With this technology, ten’s or hundreds of thousands of inkjet nozzles would be mounted directly on the “press”, now a mere paper handling apparatus. As the paper winds its way through the press the ink jet arrays would print all the desired information in one rapid pass. This would enable presses to become truly digital printing devices, with capabilities bridging the gap between offset printing and digital printing (high volume photocopying processes).

The risks of this direction are also numerous. First, it makes much of Creo’s existing product line obsolete. It in effect could cannibalize the entire industry. However, it is arguably better for a disruptive technology to come from within where it can be managed to one’s own benefit that to get blind-sided by an unforeseen competitor. By continuing to pursue this ground-breaking type of technology, Creo is positioned to stay on the leading edge of printing for another entire generation of printing technology. It is said that industry-changing inventions only come along once in a company’s history, perhaps Creo can invalidate that theory.
4.5.5 Digital printing

Another lucrative product line that came with the Scitex merger is the POS (Print On-Demand Systems) line. These are a variety of software products for controlling and managing high-end digital printing machines (photocopiers). Creo now is both a provider of the software for Xerox systems that are sold through many channels as well as a reseller of the systems. Digital printing is a smaller segment of the graphic arts world, but definitely has a niche that is unlikely to be usurped by anything else in the near future. Partnering with Xerox has been very beneficial for Creo as the software OEM business brings in steady revenue with good margins. The concern with this business is that it does not seem to provide the growth opportunities for a company the size of Creo. The POS revenue stream is about 10% of Creo’s total revenue. This is significant, but illustrates the relative scale of the Digital Printing software market as compared to the rest of the prepress industry in which Creo operates.

Another potential issue this product line brings is the attention of the competitors in this slightly different market space, such as EFI. As Creo encroaches in the software portion of the printing market place it moves much closer to a position that is threatening to EFI. The animosity created by the PrintCafe situation, combined with Creo’s lower share price in the face of EFI’s large cash reserves, generated a lot of speculation about whether EFI was going to takeover Creo as a way to enter the offset portion of the graphic arts industry. While rumors about this idea have quieted in the last year, it is still one of the only viable entry strategies for a company looking to get into the graphic arts industry.

4.6 Conclusion

Creo faces a number of significant challenges ahead of it on the road to growth and financial success. The issues are multilayered and interconnected in a tangled mess that would be daunting for any executive trying to lead the company into the future. The analyses have been presented to help clarify some of the connections and causal chains, and allow one to see the root of the issue rather than getting lost in the complications. Once the root issues are revealed, one can develop a plan of action that will best correct the problems at Creo as well as take best advantage of the opportunities it has created.
5 RECOMMENDATIONS

The challenges described in chapter four are serious and could prevent Creo from growing beyond the stated goals of Destination 2007. Action is needed now to lay the groundwork for continued growth and profitability, and some of that action is already taking place. The Digital Media strategy fills a huge gap in Creo's arsenal, but in actuality it is a defensive strategy for survival rather than an offensive one. With Digital Media, Creo is just catching up to the rest of the players. Despite a strong technical advantage in CTP equipment and software, it was not a level playing field when the rest of the companies in the market had a full array of the crucial consumables, and Creo had none. The Digital Media products will allow Creo to meet its commitments to its shareholders, but questions loom just beyond. Where next? What next? How much will Creo be able to deliver?

These are the questions initially posed in this analysis. After describing and examining the details of the situation, the choices that face Creo are more clear, but no less difficult. Creo has all but exhausted its traditional presence in the graphic arts market, or will do so soon, once the Digital Media strategy is fully implemented. The company must venture into new areas while protecting its presence in its traditional market area to fund these new initiatives. While the challenges of whatever new direction Creo takes will be tremendous, in order to protect and maintain its current position it has a variety of tasks to complete. These tasks will ensure the new venture is built on a solid performance base with few weaknesses.

Regardless of the direction the company pursues, people are the heart and soul of any company, and it is important to resolve the issues dealing with employee attitude and morale. The motivation necessary to achieve success is important in both the broad market and any new market Creo pursues. The culture of the company is still feeling the aftershocks of the merger and going public. Although the initial growing pains have passed, some other, more deep-rooted concerns remain.

5.1 Culture

The core issue at the root of the cultural concerns is low morale among the teams. As stated previously, much of this has to do with poor financial performance resulting in worthless stock options. All performance-based discretionary compensation an individual received over the last four years has become worthless. The individual feels like he or she worked hard and achieved valuable results, and it was all for naught. Circumstances beyond their control have
impacted his or her life directly. This creates a sense of powerlessness that is difficult to live with and which can potentially create a sense of despair or hopelessness. The employee gives up doing his best because it is a pointless effort that will result in nothing. There is no return on that investment. This behaviour is a type of loss or risk-aversion as is described by prospect theory. The employees know they will get paid if they work the normal eight hour day, but they have seen their extra efforts result in no benefit to themselves. This confirmed any doubts they had about giving any extra of their lives. This increased risk aversion constrains Creo's ability to deal with setbacks during the life of a project.

At the same time the size and scope of the company doubled. Because of the manner of the doubling, the merger, there have been two distinct organizational silos. These silos are based somewhat on the historical alliances and internal networks, and are reinforced by geography and proximity. North America has a more "old Creo" feel due to the location of Creo headquarters in Vancouver, BC, whereas Europe has a more "old Scitex" feel due to it being relatively close to Israel. The larger size or the company coupled with these silos make it much more difficult to effect change across the entire organization. An employee that used to be able to make recommendations and decisions and see them have an impact is now likely to see that idea die a quiet death. This compounds the feelings of powerlessness that are so de-motivating.

An additional, problematic result of the growth of the company is the increased distance from the top levels of management to the average employee. This distance makes any communication across the layers of the company more difficult and obscures the rationale behind some decisions, creating an environment of distrust. Lack of trust in the company's management was highlighted as a major issue in a company-wide survey at the beginning of 2003. Again, the lack of trust compounds with the other two factors to create a work environment in which an individual loses any sense of accomplishment, influence, or control. The demoralized thought process follows a pattern like this: "why should I work hard when management is making stupid decisions that I don't understand and are disrupting how I do my job, especially after I worked so hard to build consensus with all the worldwide teams. It doesn't matter anyways though; I was never going to see a cent of reward for all my efforts."

The final two blows to morale also have to do with the lack of growth and periodic down-sizing of the company. The rounds of lay-offs create palpable tension and worry among the employees. People are afraid of losing their job and not being able to meet their familial and

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financial obligations. There is an additional layer of guilt and sadness associated with seeing one’s friends and colleagues leave, sadness at their misfortune, and guilt about one’s own relief at being spared the same fate. The last damaging factor comes from the stagnation of the company over the last several years. The end of a project is a frightful event because of the worry that it will result in a transition out of the company rather than a new opportunity to grow and thrive. This is exactly the wrong kind of motivation for a company in which product development projects are so crucial to success.

Although somewhat trite, the key to improving morale at the company is communication. Not just empty words, though, but a particular type of communication between the senior management and the employees focused on honest acknowledgment of all the issues above. The relationship between the two groups is strained and must be improved through direct dialogue in which each side admits to mistakes and receives the feedback of the other with open minds. Some efforts have been made to this end, a biweekly question and answer session with the Vancouver leadership team rotates between the various sites, but these are sparsely attended and rarely substantive. These sessions can be improved by each manager announcing a topic that is his or her top priority. The description and dialogue that will result would shed some light on the trade-offs made in the decision making process and could potentially uncover some valuable suggestions from the audience.

Additionally, a focused campaign of dialogue sessions with the C-suite executives could go a long way to break down the mistrust. Again, open dialogue regarding the pressing topics of the day would be the most productive. It makes the C-suite more human and approachable. The teams in production can relate to the conflicts facing the president of the company if they hear about them in real words rather than press releases.

During these sessions, both the ones with local management and the C-suite meetings, it is vital that egos be checked at the door. The management team needs to admit to the failings in the company. Acknowledging problems, describing the direction of a proposed solution and then acknowledging the tradeoffs of that option creates a sense of transparency and fosters trust. All this must be done without appearing patronizing or irritated at the questions. Although this kind of openness is seen as a nuisance by some, it will help restore lost faith in the myriad groups and product teams. The low morale at the company could be considered one of the top issues at Creo and so requires the full attention and commitment of the C-suite. Management needs to realize that they do not generate the revenue, it is the teams. By motivating the teams they are enabling better operations and higher revenue. This is truly a situation where leading by example is
necessary to salvage the situation. At the same time, it is incumbent on the employees of the company to try to understand how the business decisions are made, and to realize that downsizing is a sacrifice that must sometimes be made.

Once trust has been re-established, the same communication forums can be used to build hope. Future opportunities can be a point of discussion in these sessions. Engaging the employee base in developing new ideas is a powerful way to create a new sense of ownership in a large organization. If the financial situation of Creo does not allow for growth or additional opportunity then a frank discussion needs to occur regarding possible options. This is a tremendously difficult discussion, but a necessary one nonetheless. It may not result in a painless process but it does cement the integrity of the management team in the face of difficult circumstances.

The risk of this open communications strategy is that some will lose confidence when the leadership shows uncertainty and vulnerability. Without a doubt, there is a range of leadership styles appropriate for different circumstances and different groups of people. In the climate of little faith and less trust the only thing that builds faith is honesty and success. Mistakes are tolerated if they are a part of the process of growth and learning, but persistent errors and poor performance does indicate that a change of management may be required. This does not appear to be the case right now at Creo. The C-suite is very bright and has an array of good ideas with which to take the company forward, they first need to regain the confidence of the employees.

The lack of personal growth opportunities can also be addressed via two existing roles that already exist at Creo. The organizational structure of Creo includes two engineering roles that are not focused on project deliverables. One is a role called the Section Head and the other is a role called Principle Engineer. The Section Head is a functional role that is responsible for the review process of individuals. The role exists to provide continuity of supervision for employees as they move from project to project, some mentorship and a point of contact for non-project issues. The section head has no immediate deliverables, but is responsible for the long term growth and development of the individuals in their section. Sections are usually comprised of six to eight individuals of a similar job discipline such as physics, firmware development, and mechanical engineers. The section head model is currently applied in a haphazard manner among the different product development groups and does not exist at all in some functional areas and regions. Efforts are underway to revamp and refocus this role to ensure the mentorship function is being fulfilled. Expectations and performance criteria are being defined for the section heads as well. The efforts to clarify and legitimize the role are intended to build a more
robust mentorship system. This mentorship system will hopefully provide development and
growth activities for the members of the section. The idea is that even in tough times, when role
and salary growth is more stagnant, Creo can keep developing its people. The section head role
itself is something of a growth path for engineers as it could be a stepping stone to more
leadership responsibilities.

Principle Engineers are the technical elite of Creo. It is a role created by Dan Gelbart to
recognize those who show sustained, high-level engineering performance. This role was also
created to provide a career track for those who preferred to stay technically oriented. Rather than
move into project and product management and lose their technical edge, this role allows Creo to
provide a career ladder for the best designers. Principle Engineers are self-designated and
interface with senior management regularly. In the past they have had the ear of Dan Gelbart and
were also given ranking visibility to the high-level middle managers. As the company has grown
the role has dwindled into something of an honorarium, though. As they lose visibility into the
broader scope of the organization, the Principle Engineers do not work to stay engaged in the
overall company and specific project demands overshadow problems of a broader scope. This
group of top minds is not being leveraged effectively beyond whatever specific project on which
they are working.

Redefining and expanding this role would also extend the growth opportunities for
engineers and developers. One idea would be to create a product-group-specific Chief
Technology Officer (CTO) role. This new role would be responsible for ensuring that Creo stays
 abreast of all developments in a specific area of technology and would help lead the innovative
push in the product group’s domain. The most likely candidates for these CTO positions would
be the Principle Engineers, and this would provide a growth path for them. It would engage
these very bright minds in a more serious, broader way. It also might resolve a less pressing, but
serious concern about CTO succession after Dan Gelbart retires completely. Dan is no longer
directly involved in day-to-day company operations, but he is very active in researching new
technological ideas. Much of the innovation in the company stems from him, and there is no
recognized replacement for this spark. A product-group-specific CTO role would be a good
proving ground to see if comparable innovation could be nurtured and grown.

Another area the Principle Engineer and CTO roles could contribute is defining and
describing best practices for their specific discipline. Codifying much of the accumulated
knowledge would aid in propagating expertise and hopefully make Creo even more efficient at
bringing technology to market. Part of this aspect of the role would consist of mentor-like activities, again enabling growth opportunities for the rest of the product group members.

The combination of focusing on mentorship activities with specific, accountable roles will go a long way to building a strong culture of learning and growth. Everyone can benefit from mentorship at all times throughout their life and career. The mentorship that Creo provides should not simply be concerned with technical proficiency, but should also include cross-discipline abilities and skills and organizational sciences. This learning environment will provide a conduit for employee goals and ambitions when economic circumstances have stagnated and will position the entire organization to take better advantage of the concrete opportunities when the economic circumstances have improved.

Even after taking steps to improve company morale, Creo will still have to deal with some additional issues that frustrate and challenge the teams and managers. One of the foremost of these is coming to grips with multiple product development centers spread across two continents and ten time zones. The systems that Creo engineers are complex and require that each piece and component work together in harmony. The communication challenges that arise when the engineering teams are not down the hall from each other are numerous and directly impede the smooth integration of the parts of the graphic arts systems and software to each other. Part of Creo’s historical ability to get technology into the market stems from a fluid, dynamic, ad hoc design environment - an issue is discovered, office doors are flung open and there is an intense problem solving session at the white board. Developing systems across an ocean requires a different style of work, one that is much more reliant on planning and documentation. These are activities that most engineers find unpalatable and the necessity of them is viewed as the degradation of a vibrant working culture. There is little recognition of the need for greater discipline when it comes to collaborating and communicating across many time zones.

Presumably, developing products across multiple remote sites accesses a greater pool of talent and provides more flexibility when it comes to resource management for a company. However, it is not clear how to best compare these benefits with the cost of delayed product releases and reduced team morale. Remote product development will without a doubt create a greater sense of frustration among those who work on the project. The worst result is that each part of the team withdraws, doing their part in isolation, and producing a system that does not work very well. The best course of action is to completely segment the product development activities in each region, building multiple distinct centers of expertise in unrelated activities. This allows the teams to avoid the remote development challenges altogether.
Avoiding the problem is not always possible though, so the question remains, how does a product development team best deal with the issue. A multi-step approach based on best practices for tele-commuting addresses the majority of the challenges. Prior to implementing these techniques though, the most important first step is getting complete buy-in and commitment from every member of the team. Live, face-to-face discussion of the issue and the challenges ahead will go a long way to building the necessary relationships to make the development teams work together. Team-building time spent in the early stages of the project will also greatly enhance the cooperation among the separated groups. The travel costs associated with the start-up activities will cause Creo management to blanch, but when considering the value it would bring to a $20 million project, proper perspective must be kept. Unfortunately, one complicating factor exists with respect to this strategy: Middle East tensions and conflict make Israel very unappealing to many of the developers located in Canada. It does not seem fair to make the Creoites from Israel always travel to Vancouver, but it is much easier to do. The inequity should be acknowledged and concerns about travel to relatively dangerous locations must be respected.

5.2 Growth and Market Focus

Creo is at a crossroads: either it tackles the broad printing market wholeheartedly or it attacks a new market with sufficient growth opportunities. One of these options is necessary to continue to grow the company, and growth is assumed to be required to maintain share value if a certain level of profitability is achieved and sustained. The two options entail significantly different actions to implement. The new industry choice leverages the innovative talent and systems thinking of Creo's engineers against a new problem set, whereas the broad market option may require an entirely different set of skills and competencies to succeed. The disadvantage of the new market option is that it is new and not well known (or even identified), plus, the C-suite at Creo believes that tackling new markets is a very risky course of action. The broad market is relatively well known and understood, but is a more commoditized product arena. It is not clear that Creo possesses unique, sustainable differentiation for the needs of the small printer. Without this fundamental value proposition, the market is more likely to be won via a price war, with the company most able to tolerate low margins being the one who will survive. This is not as favourable a business environment, especially since Creo does not have the financial resources to outlast some of its larger competitors. In a war of attrition Creo would likely end up losing.
5.2.1 **Tidying Up Graphic Arts**

Prior to or in parallel with the choice to either pursue the broad market printers or focus effort on new industries, Creo must also ensure that the higher end of the commercial printing market is well in hand to the extent necessary to fund the new initiatives. This is the foundation of the company, the major revenue generating area and the springboard for growth in any direction. Tying off these few loose ends will secure the financial health and resources of the company, enabling it to roll over the inevitable bumps on the road to success in the new areas.

5.2.1.1 **Digital Media**

The first and most important item to resolve is the introduction and establishment of a strong Digital Media business. This is a very large loose end in that it is an entire business initiative in itself. The entire value generating process must be established and refined and warrants a strategic review itself. R&D has work to do to bring the product offerings down into a sensitivity range that is more competitive. Right now the media is slower than many others, so it does not allow the devices to run at their maximum throughput. The marketing team needs to work hard to establish the quality and reliability of Creo as a consumables provider. Manufacturing needs to learn how to maintain quality control without reducing the capacity of the production line. The sales force needs to learn how to best sell the new and powerful combination of Creo media bundled with Creo CTP devices and driven by Creo software. The service force then has to follow up on every installation to help maintain the reliability and quality of the product. Additional complications that are new to the company are the logistics of delivering consumables in a timely manner around the world from remote production locations as well as subcontracting processing equipment from third party processor manufacturers. These issues are all clearly identified and being addressed at Creo, but the importance of resolving all these issues cannot be overstated. The consumables business is key to the survival of the company, and therefore more than necessary for any future growth.

For the broad graphic arts option the consumables strategy is even more important because the success in the high end of the printing market will be directly leveraged by the smaller printers. Creo Digital Media will be a key/vital/necessary part of the product bundle for the broad market, whereas in the new industry growth option it will just generate revenue to fund efforts.

As logistics and supply reliability are so important in the media market, one clear option to deal with those challenges is to bring additional production facilities online. This creates
redundancy in the production capacity and helps ensure reliable supply and, if the production facilities are geographically diverse, helps alleviate some of the distribution logistics challenges. Plates would no longer need to be shipped from South Africa to a customer in Small Town, Idaho - or, worse yet, Small Town, Siberia. A plant in Eastern Europe would serve Europe, the Middle East and Russia very well.

Creo sold a block of new shares in the early part of 2004 to generate the necessary capital to pursue initiatives like this. The expansion of Creo Digital Media capacity is an investment that, despite its necessity, will likely show excellent return.

5.2.1.2 Focusing on Differentiation

Even if the decision to pursue the broad market is made, Creo must reinforce its position in the high end of the industry. Those printers produce the high volume print material that is demanding of the stability of the system. They are also the printers who are more likely to do high quality photographic reproduction. For this kind of work the Creo message of value is clear and obvious. This is in contrast to the short run, single color work on uncoated stock that is the bread and butter of the broad market where the value of SQUAREspot is less clear. Significant effort needs to be put into the marketing of the process control message to build up the value proposition of Creo’s imaging technology. The advantages of Staccato Screens imaged with SQUAREspot technology are numerous, but the power of this combination needs to be demonstrated to the market in a more convincing way. An old fashioned ad campaign pushing the idea out will lay the ground work for the sales team delivering the return on investment (ROI) message. Press tests and experiments demonstrating process stability need to be conducted and documented by credible, impartial third party research teams. Creo should sponsor research at the Rochester Institute of Technology, an institution known for its involvement in the graphic arts industry. These more traditional approaches to creating and delivering a message to the printers of the world will better support the ROI message that Creo has traditionally relied upon. The technology will no longer simply sell itself when competitors are doing their best to mimic Creo’s imaging systems. In a sense, these efforts are defensive in nature as they protect the differentiation message rather than take a new tack at the same market space.

Creo has been using the Staccato/SQUAREspot approach for a number of years and the combination is gaining momentum, but it still needs to be accelerated. The current strategy involves showing real press samples from customers who believe in the message. The quality of these samples is evident and is an effective selling tool, but they don’t eliminate the suspicion
regarding how the print was done, or how difficult a given job was. True comparative press tests must be done to show the true impact. This relatively simple exercise will generate excellent material with which Creo can stay engaged with the market and demonstrate value.

5.2.1.3 Adjustments to the Sales Team

Creo’s sales force has recently been bestowed a powerful new tool with the roll out of the Digital Media products. They can now more easily play the bundling shell game to help obscure maximum discounts and finance equipment sales through long term media contracts. This should significantly improve their ability to close sales; however, prior to the introduction of Creo consumables the sales force showed a dismaying inability to create a convincing message differentiating Creo’s products and technology. As stated in section 5.2.1.2, the message needs significant support, but it should have been better able to stand on the foundation that existed previously. Selling the value that process control brings to a printer is a difficult task because it involves convincing the printer that the way they have always done things is wrong. Creo is trying to stamp the craft out of the industry, but the craftsmen are some of the decision makers when it comes to purchasing prepress equipment. The sales job is actually a change management activity, where the salesperson is trying to incite a paradigm shift in the way the potential customer thinks about producing print.

Changing people’s fundamental conception of how to do something is a difficult task that many of the sales force are not fully prepared to do. Engaging behavioural scientists for strategies and advice on how to push Creo’s ideas would go a long way to creating a stronger tool kit for Creo salespeople. Pushing these concepts into the sales force via intensive training and practice sessions would best prepare the entire team for engaging in and winning difficult sales campaigns.

Additionally, it is crucial that Creo either augment the sales team to gain better coverage or improve the efficiency of the salespeople to allow them to cover larger regions and still compete effectively against the likes of Dainippon Screen (who have, for example, dozens of salespeople and dealers in one Creo sales region). To that end Creo is developing a telemarketing team to better pre-screen sales opportunity. It is this type of activity that will help a salesperson more effectively cover a larger region - he or she will no longer waste his or her valuable time finding and qualifying legitimate leads. It changes the sales process from blindly mining for gold to seeking buried treasure with a map. The telemarketing initiative is an incredibly powerful tool that should be used as a launching point for similar activities aimed at
improving sales team efficiency. Another attractive ramification of this initiative is that it replaces relatively expensive sales people with relatively inexpensive telemarketing teams.

The recommendations for improving the sales force can be summarized as two investments in ways to make the sales team as efficient and effective as possible. The telemarketing initiative will focus the valuable resources where they are most likely to produce results and the change management training initiative will improve the team’s chance of success at each of those targeted opportunities. Together, the sales team should be able to generate significantly higher revenue streams, thus fuelling Creo’s growth.

5.2.1.4 Re-examining Creo’s Presence in the Flexographic Market

Packaging is one of the fastest growing segments of the printing industry. A significant portion of package printing is done with a kind of printing called flexography. Flexography is different from offset printing in that ink is carried on a large rubber mat that is, in effect, like a large rubber stamp. The creation of these large rubber printing plates is a slow, problematic process that involves significant post-imaging processing. Moreover, flexography is a particularly challenging industry to pursue because it is very segmented. Each type of packaging and every substrate generates significant permutations of work techniques. Flexography is a requirements analysis thicket and any product manager’s nightmare. Only one other major player exists, Esko Graphics, and it is locked in a CTP battle with Creo. Esko was the first to bring CTP technology to the flexography market and was therefore able to develop a relationship with the dominant media provider, DuPont. This combination has been difficult to attack and Creo device sales have been low for the entire life of the product line.

Creo went after the flexography market for the wrong reasons. First, it was thought that Creo needed to have a presence in every aspect of graphic arts to build credibility. This is likely a faulty line of logic, but it has persisted. Another factor seems to have been pure stubbornness and unwillingness to give up on the market. Management at Creo did not want to lose to Esko. These factors have caused Creo to push a substandard product into the market; it is not faulty, but it simply does not perform very well, is not differentiated in any way, nor does it provide substantial value to the customers. The strength of Creo’s engineering is such that a substandard product has not been laughed out of the market, but, again, it is not differentiated from the competition in any meaningful way.

Plans are in the works to resolve the two major issues facing the product line. A new imaging system is being evaluated for feasibility. This version would not have the limitations of
the current offering and would greatly surpass Esko’s offering in terms of plate throughput. The other initiative is concerned with developing a media that could be bundled with the imaging equipment and software to provide a package solution analogous to that offered in the offset printing market. Finally, as a parallel initiative, Creo has been in discussions with DuPont about loosening Esko’s grip on the media bundle. If Creo gained equivalent access to the media DuPont produces, this would go a long way to stimulating the current product line. It would sustain Creo while the other development initiatives came to fruition, and would prepare the market for a stronger Creo presence.

However, these initiatives must be make-or-break in nature, especially the imaging system. If the technology does not fulfill its promise, Creo should withdraw from flexography as quickly as possible. It has been a persistent distraction for several product development teams and has undoubtedly consumed far more resources than it justified. The gating issue is the imaging system. Without it, the media development efforts cannot be leveraged and so would be worthless if pursued independently. The damage done to its reputation by discontinuing the flexography product line would be minor compared to the opportunity cost of the people and materials put into flexographic imaging systems.

5.2.1.5 Third Party Service Providers

The relatively new phenomenon of third party service providers is currently a minor issue, but has the potential to become significant. Service contracts make up approximately 20% of Creo’s revenue and the erosion of this revenue stream could offset many of the gains made via the rest of these recommendations. The development of competing service providers has other disturbing ramifications as well. The primary among these is the potential damage to Creo’s intellectual property. Creo engineers are not taught every secret about the design of the systems and software, but they are exceedingly well trained. Creo trains the engineers based on the philosophy of giving them enough system knowledge to be able to troubleshoot, diagnose and repair systems in the field independently. This is a powerful set of knowledge that is likely what makes the appearance of these new service providers possible.

Protecting the service contract revenue stream means differentiating Creo’s in-house service as superior to the third party organization’s. A marketing campaign highlighting the extra value Creo service provides, such as the latest firmware and software updates, more experienced engineers who receive continuous product updates and information about the various products, and access to the design engineers in the case of truly intractable problems,
may help convince the wavering customer to pay the higher price. A word of mouth campaign discrediting the abilities of the third party engineers might be appropriate as well, especially when targeted in regions of local strength for the third party firm. Reminding printers of the mission critical nature of the equipment and the increased potential for downtime with the third party provider is another message that could be used to effectively dissuade customers from switching.

The primary concern about intellectual property has more to do with the potential for these third party engineers to start working with our competitors. A Creo trained field service person that was laid off in one of the several rounds of cost cutting exercises could well be tempted to go to Agfa or Dainippon Screen and tell them more than Creo is comfortable with about the control and operation of the systems. Creo has employees sign contracts when they are hired concerning the use of any Creo IP for activities not endorsed by Creo, but the practicality of proving that this contract is being violated is low. Concern about this is actually a bit late in that the damage has been done. It does prompt one to realize Creo needs to make its equipment less transparent to the trained user. Simplifying the interface and hiding the inner workings more would better protect any sensitive information. Future products should be designed on the assumption that the technology will fall into unfriendly hands, and therefore, anything sensitive nature should be protected sufficiently to guard against this circumstances. This may mean designing more intelligence into the products and relying less on the engineers to troubleshoot and repair problems in the field.

5.2.1.6 Supply Chain and Intellectual Property

In order to resolve the issues concerning single-sourced components Creo must continue and even increase its current efforts to find alternative sources. Innovative ways of qualifying vendors can be utilized that will minimize any distribution of intellectual property, but will allow for thorough evaluation of the vendor’s capabilities. Camouflaged test patterns and alternative specifications are examples of methodologies that should be employed. These efforts will enable the first round of screening for potential vendors. Once this first round is complete Creo will then need to release the real set of specifications to the most promising of the vendors. These specifications need to be tied tightly to a Non-Disclosure Agreement preventing any release of information Creo provides to the vendor.

Once vendors have been identified, Creo should make sure to segment the value chain to prevent any one vendor from obtaining too much information about the final assemblies.
Handling the more complicated coordination efforts is worth it to protect the vital pieces of IP that risk being exposed by these initiatives.

These efforts are likely to produce sources of components that are more expensive than the existing single-sources. This is inevitable due to the reduced process optimization and increased transportation of the various parts and pieces. The impact of splitting order quantities is also likely to carry a price penalty. These extra costs can and should be viewed as insurance to protect both the supply lines and the intellectual property.

Another initiative that can be pursued specifically for the laser diode supply is the investigation of technologies that will help relax the requirements in the diodes. One of the main roadblocks to finding additional diode providers has been the quality requirements placed on the diodes. The optical technologies in question could significantly reduce the quality necessary in the raw component, with no degradation in system quality. The impact of this possibility is huge and should be investigated with a high priority.

5.2.1.7 Summary

The actions described above, when completed in conjunction with each other, will strengthen Creo’s presence in its traditional market significantly. It will be conveying a stronger, more convincing message in a more efficient and effective manner, while also protecting its revenue streams and intellectual property. The potential cost increases due to segmenting the supply lines should be offset by the increased bargaining power resulting from having multiple sources. When the improved focus of the product development team is combined with the power of a full product array with the inclusion of Digital Media, Creo will be poised to win the enterprise segment of the graphic arts market. This ensures Creo will be best prepared to tackle the rigors of the more competitive end of the market or to set off to win new markets.

5.2.2 Heading Down Market

Almost ten years after its introduction at DRUPA 1995, thermal CTP technology and all the related products are the norm in enterprise level print shops (those printers with greater than $3 million in revenue a year). Creo and its competitors have sold thousands of devices into that market. So many devices, in fact, that the CTP market in Europe and North America is soon to be saturated, so that device sales will be determined by the replacement rate of machinery rather than adoption of new technology. By 2008, Creo expects the number of devices sold per year to the enterprise segment to be at its peak. A whole group of printers exists that has not yet adopted
CTP technology due to price sensitivity. The Asian and Indian markets consist largely of this more price sensitive market. Addressing the broad market means changing the entire cost structure of the prepress equipment value chain.

In addition to generating smaller revenue streams, small commercial printers (those printers with less than $3 million in revenue and less than 30 employees), also generally do lower quality, lower resolution work. The percentage of image variation for a normal amount of process variation is less for lower resolutions because of what is called the edge-to-area ratio of a given screen and image; this implies that process control requirements are lower when doing lower resolution work. Connecting these two concepts results in the understanding that Creo’s core differentiating message, process control, has less import to the smaller printers who are doing low resolution work. Why should they pay a price premium when they need the differentiation less than the larger, higher quality printers do? This argument is valid, but only if a smaller printer settles for status quo in terms of its own ability to differentiate. This then reduces the impact of the differentiating message and shifts the sales process back into a price war. Printing work at a higher level of fidelity or resolution is more demanding in some ways, but also has some tremendous printing benefits even if the work is only made up of a single color on uncoated, rough paper. The higher resolution Staccato screens do not need to be used just for glossy photo magazines, they can also be used to reduce ink consumption and improve color stability over the duration of the print run. These effects benefit printers of all sizes. Creo is trying to get the entire industry from top to bottom to switch to frequency modulated screens like Staccato, as it accentuates the process control message and actually requires the high precision capabilities of Creo’s imaging systems. While technically valid, this message is viewed with suspicion. The market does not believe that Creo is representing all the facts when it says printers should shift to a new kind of screening. It sounds suspicious because the other half of the message is that only Creo technology is capable of doing this new kind of screening reliably. It seems too convenient and too much like a clumsy marketing ploy. This suspicion and the resistance to the Staccato/SQUAREspot combination message may make it necessary for Creo to change technological direction and abandon the process control push. This will lessen the need to develop precise imaging lasers, but may improve the robustness of other aspects of the system. The trade-off would need to be evaluated carefully. It is not likely that the process control robustness could be combined with the level of system reliability that is required for the broad market.
Because of the currently weaker value proposition of thermal and the severe price competition, the broad market is such that Creo continues to question whether or not it would be very profitable. However, the offset printing process is still lacking in robustness. Parts of the system can be finicky and may require significant attention to keep the performance at an adequate level. The cost of the required level of service is high, and it is clear the broad market will not accept that expense level. Less costly systems need to be developed. Currently, Creo can maintain its products profitably because the larger commercial printer is willing and able to purchase service contracts which are priced as a percentage of the equipment they cover. A larger printer conducts a larger sale, which produces larger service contract revenue. For smaller printers the amount of the sales and the resulting service contract revenue does not always cover the cost to maintain the installation. Raising prices to cover costs would not be tolerated and service contracts would be sacrificed. This need for robustness creates a path into the broad market that would allow it to still be profitable.

Despite potentially moving into a more price sensitive portion of the market, requiring a very different cost structure, it would still be possible for Creo to employ a differentiation strategy. To differentiate itself in the broad market, Creo needs to develop a more robust prepress system. Bringing stability and reliability to the systems will reduce the total cost of ownership to the customer and preclude the need for a pervasive service organization to keep the mission critical equipment up and running. This robustness must also be incorporated into the system without sacrificing too much performance in the other categories with which prepress systems are compared. Now that Creo has a full suite of products it is in a position to control all the system variables, and instil robustness in the printing process. Interconnecting the various parts of the process will allow the optimal prepress conditions to be maintained. One way Creo’s consumable development competencies are already contributing to this direction is in the development of processless plates. These are plates that do not require chemical development, and are truly digital in nature. This characteristic makes for a much more robust imaging process, as would be required for the broad market. The loose strategy that Creo currently has for the broad market hinges on the introduction of the processless consumable product.

While the system reliability would be a differentiating feature for a broad market offering, it would also be a cost enabler for Creo. As stated previously, it would reduce the necessity of an expensive team of service engineers. A more robust, automated system could also be sold more effectively by a dealer network, thereby avoiding an expensive sales team. The dealer network would be better able to sell the equipment because the system would require less
expertise in the configuration and set up. Ideally Creo systems would become “plug-n-play”, self-calibrating, self-diagnosing, and self-tuning. This product direction is contentious, however, given the fact that this level of automation and control is often expensive to implement, both in the R&D required and the feedback systems engineered into the products. The obvious conundrum is how to build a system with the required level of reliability for a low cost.

The other difficulty that would arise in pursuing this direction is in building a solid dealer network. Creo’s initiatives in the enterprise segment of the industry have alienated many dealers and it would be difficult to re-establish those relationships in order to distribute the improved systems. Developing dealer networks is crucial for a couple of reasons. The first is simple coverage. A direct sales force competent enough to serve printers would need to be immense to be able to reach the full scope of the broad printing market. The second reason is cost. A sales force this big would be expensive to maintain and therefore would not be compatible with the business model and cost structure required for small commercial printing. Tapping into the dealer network and leveraging their existing contacts, focused regional knowledge, and their expertise in the industry would help keep Creo’s costs low while still keeping the channel profitable. Recreating these advantages via direct channels or a wholly owned subsidiary dealer network is not realistic.

Creo will need to learn how to distribute their message more effectively to the multitudes of broad market printers. Consumer and small business marketing approaches would need to be used. Trade magazine ads and telemarketing campaigns in conjunction with extensive dealer support would likely be the best avenues to push the message. Xerox has used an effective approach for mid-range photocopying equipment. A broad market product offering would be analogous to these kinds of equipment. Trade show presence would switch to being focused on establishing dealer relationships and expanding distribution capacity rather than interacting directly with customers.

Another angle to be considered would be bundling with providers of smaller presses to provide all the equipment necessary to set up a small print shop in one easy-to-use package. This strategy should be considered in growing geographical markets, but would not be worthwhile in regions where print shops are at saturation. Relying on the press bundling strategy in this case would tie Creo sales to the replacement cycle of the presses, which, from current market experience, is too long to provide for a profitable business model.

As stated in chapter three, Creo has been investigating the development of a credit service to provide its customers with financing and leasing options. These initiatives are likely
to be crucial to the marketing efforts of the move down market as well as the profitability of the market segment as a whole. Service revenue will be replaced by interest revenue from financing options. This business model is well proven in the automotive industry around the world and should translate very well to the graphic arts industry. The financing products would also be sold through the dealer channel and dealers would be incented to sell Creo financing as part of the bundle to the prospective customers. Financing is not necessarily a competency Creo wants to acquire, so the sourcing of these services under a Creo branded initiative would be the best approach initially. Accepting the credit risk of financing will undoubtedly incur some cost, but a key part of structuring the program will be understanding the comparative benefit of reducing the roadblocks to ownership for prospective customers. The cost of accessing the additional portion of the market is the cost incurred via management of the credit program and the bad debt exposure.

Creo’s approach to manufacturing would need to be extensively reworked to produce systems aimed at the lower end of the market. The volume of the devices would be significantly higher, creating a need for much more capacity than either of the device production facilities in Israel and Canada could currently handle. New capacity would need to be developed, either by expanding current facilities or sourcing new ones. For broad market volumes a Ford-style assembly line could be very appropriate. Engineering the system to be manufactured in this manner would also potentially allow the systems to be manufactured by less-skilled and flexible labor. These types of activities should be considered for the enterprise market systems as well, but may be precluded by the performance criteria of the high end of the graphic arts market. Establishing a more automated assembly line would also allow the sourcing of production facilities in less expensive North American regions such as Mexico, where labor costs could be reduced with fewer challenges and better IP protection than Creo would have if it outsourced production to China.

Perhaps the single largest task in shifting focus to the broad printing market would be changing the focus of all the people throughout the organization. The high quality, differentiation philosophy has been practiced at Creo since it was founded. The company has always thrived on making the technically impossible possible. Figuring out how to make robust, “good enough” CTP equipment faster, cheaper and in higher volume is not a problem set with which many people at Creo have experience. The engineers are used to figuring out how to push performance specifications as a result of Creo’s race to maintain differentiation. The sales people have been hand picked and recruited for their ability to sell the differentiated value
proposition on which Creo has relied. Even the service team would be phased out and diminished as the engineering teams designed systems to be self-diagnosing and more robust. At the most, the business model would support a less sophisticated service team that was skilled enough to replace field replaceable units (FRU’s), but not at all able to diagnose more subtle problems.

Heading down market would truly be like changing the religion of the company. All the changes listed above, in addition to others not described, would require the rapid shift a large portion of the company’s mind- and skill-set. It is questionable whether this is even possible. One possible ramification of pursuing the broad market might be the need to hire a new group of people into many roles currently filled by long-time Creoites. The current engineering teams are well suited to developing the sophisticated control systems that would achieve the required robustness described above, but they are not well suited to engineering these solutions into a lower cost and lower performance imaging system. The same issue exists with the current production team. The group is technically astute and very capable, but are not as knowledgeable of larger scale manufacturing techniques. An analogous situation would be the Rolls-Royce production line as compared to a Toyota production line. The automotive industry is actually an excellent source of employees better suited to a broad market strategy for Creo. A simple, but potentially powerful step in that strategic direction would be to hire a senior experienced production manager and design manager from the automotive industry. High performing talent from that background would be better able to assess Creo’s current position and help push the company to competence in the high volume market.

Changing personnel is not a particularly palatable suggestion. Creo could also attempt a large change initiative to redirect the company. The employee base would need to see a detailed assessment of the impact in each of the product and functional areas. The strategy would have to be studied and understood in minute detail to be able to convince the employee base that the business model was superior to the differentiation strategy. Some evidence that the robust product requirements were possible would be necessary and tours of other industries’ design and manufacturing operations would be beneficial to show team leads and manager examples of how to achieve the high volume goals. The cost of this amount of change management would be significant. The internal focus of these efforts would reduce the company’s ability to meet its customers’ needs while the organization learned a new way of thinking. The opportunity cost of the efforts would be tremendous as well as many employees would be learning new techniques and skills rather than leveraging existing skills on differentiation challenges.
In total, the shift down market would be a huge undertaking for Creo. The system and product development efforts to create more robust systems and more manufacturable products combined with altering the company’s core value proposition and marketing message, the establishment of new distribution channels, the reworking of manufacturing methods and facilities, incurring the credit carrying risk of a financing product, and, most importantly, changing the employee attitude or actual makeup to support all these activities are, in aggregate, almost an entire makeover of the company. This would be a difficult option to pursue, but if the company had sufficient commitment, success would be entirely possible. The crucial first step would be to make these changes in the Output Devices product group, which is the historical heart and primary revenue earner of the company. The Digital Media products are well suited for any portion of the industry, so the transition would be less difficult. PWS is more easily capable of de-featuring its products and has none of the manufacturing line challenges that the hardware group has. Once Output Devices is steered in the right direction the rest of the company would be able to follow them in successfully capturing the broad market.

5.2.3 Disrupting Graphic Arts Again

If Creo decides to remain in graphic arts in any form it needs to look for ways to revolutionize the industry further. The CTP process is a tremendous improvement over the older computer to film (CTF) processes, but how can one eliminate the plate portion of the process? Creo is considering this problem in depth and utilizing its innovative expertise to again position itself at the forefront of printing technology. Through these efforts Creo has the potential to change the entire graphic arts market again. The possible change would be, in fact, even more revolutionary than the switch from film based processes to CTP. This new technology would potentially allow ink to be put directly on paper as precisely as with the offset process. It would eliminate an entire class of equipment and consumables from the processes of the printer. There would be substantial reduction in the waste that is created in the printing process and would be the ultimate in the output flexibility of the press. The digital information would be fed directly to the press which then would use Creo’s industry-changing inkjet technology to put exactly what was needed on the paper, when it was needed. High quality glossy print material could be completely customizable. This would be a huge boon to both print buyers as well as sellers because of the potential for targeted advertisement that would be made possible by inkjet printing.
This technology would have a huge impact on Creo as it would obsolete the company’s largest product group, Output Device, as well as the Thermal Consumables group. Both of these groups would have to be repurposed to support the new technology and products. The mechanical and electrical engineers of the Devices group could focus on making the “press” components which handle the paper, etc. The chemists of the Thermal Consumables could shift their focus to ink and paper chemistry. Some other expertise might need to be hired, but the product groups provide a good base of known skills on which to develop a new set of products. Having a disruptive technology come from within the company rather than from outside it is much better than the converse. Creo would be undertaking a huge and painful change, but it would be doing it to itself rather than being blindsided by another company and reacting only for survival.

This change would not occur overnight, but would last the duration of the industry’s adoption of the new technology. The value of this direction to a printer is tremendous, but the level of investment to retool a print shop around inkjet technology would be a barrier to rapid adoption. While the transition to inkjet technology was occurring, continued support work for the existing technology would need to happen, albeit on a much smaller scale. One feature of the inkjet direction that is facilitating or simplifying for Creo is the versatility of the technology. There is no confusion about whether the value proposition applies to one portion of the industry and not others; because of the truly digital nature of the inkjet technology, it is eminently scalable, therefore easily tailored to suit different portions of the printing market. The lack of a good dealer network would impede Creo’s introduction of this technology to all levels of the market, much as it impedes the company’s efforts in broad market CTP. Creo’s sales force is not extensive enough to cover the broad market is Europe and North America. However, the revolutionary value proposition this inkjet technology would bring would likely go a long way towards rebuilding the bridges to the dealers. The dealers simply would have to work with Creo in order to gain access the on-press inkjet capabilities.

Regardless of which growth option Creo decides to pursue, going down market as described above or going into new markets as described below, Creo should continue the investigation of this potentially industry shaking technology. Continued growth and success demands continued innovation. This innovation does not always have to be on the product level, but innovation in development often provides a more sustainable advantage than many others. A company should take advantage of any innovation that is rewarding enough, regardless of where in the organization it comes from.
5.2.4 Venturing into Uncharted Territories

The other option for Creo to pursue while attempting to achieve its growth and profitability targets is diversification into other markets, where it can leverage its product development capabilities in optics, engineering, chemistry and software to create technologies that change the way those industries work. Creo is tentatively exploring this direction via a development contract with the DuPont Corporation. DuPont and Creo are working together on a system that would manufacture color filters for the LCD industry. Creo is developing a flatbed imaging system that can be used to put patterns on any type of substrate, and DuPont is making the thermal transfer media that would make up the color filter.

The technology that Creo is creating with this flatbed imaging system can be generally classified as mask-less lithography. It is denoted as such because many flat substrate materials in a variety of industries are patterned by a process called photolithography that utilises very precise and expensive photo-masks. The entire semiconductor industry is based on photolithographic processes. Photolithography has many drawbacks that are analogous to the drawbacks of film in the printing process. Creo’s imaging platform could potentially take photo-masks out of many processes like its CTP engines took film out of graphic arts. This would bring an entirely new dimension of flexibility to portions of the display and electronics industry that has never existed before. It could also remove a large portion of the equipment and consumables from these industries as well, improving the cost structure and making it either more profitable or more competitive. Creo’s technology would enhance the possibility of displays overtaking print into the future. Again, it would be disrupting its traditional industry, but it is better to be the initiator of such change than have to respond to it unexpectedly.

A key aspect of this option for Creo is that it is likely to require the acquisition of a partner. This partner should be either already very conversant with the industry Creo decides to use as an entry point, or significantly invested in a new market and therefore very committed to the venture. In the case of color filters and DuPont, DuPont is paying Creo for the development of the imaging platform, but Creo will retain all the rights to leverage the platform in non-color filter applications. Creo is avoiding a significant portion of the risk by having DuPont fund the development of the platform, but a drawback of this arrangement is that Creo is not fully committed to the venture itself. It is invested only as much as it needs to be to meet its contractual obligation. Senior management will not allow the company to become more committed. This reluctance prevents Creo from really focusing on success in the industry; and
forces the team to simply strive for success within the confines of the development contract. This lack of will might well undermine the entire project.

A true partnership in a new industry venture would require more equal levels of investment and call for the complete commitment of both parties. Going into a new industry is a risky proposition, and not having the will and nerve to be committed to the endeavour makes it that much less likely to succeed. If Creo chooses the new industry growth option it will need to commit additional resources and truly chase the industries it has identified as legitimate targets. As well, this display of commitment is likely to attract higher quality partners.

The potential markets in which this new imaging platform could provide value are numerous. Coupling this imaging platform with the possibilities of additional workflow software for a particular industry and potential consumables for that industry would fully leverage all of Creo’s core competencies in a new way. Some of the possible industries include other display technologies such as plasma and organic light emitting diodes (OLED), printable electronics such as would make up radio frequency identification (RFID) tags for consumer goods, and even some biological applications. These industries are themselves projected to grow at 30% to 40% per year for the next several years and the market size of each of them is $5 to $10 billion. Even if the sum of these other industries was only $10 billion, it would still be quadrupling the addressable market for Creo. The value proposition for these markets is quite strong as well. The flexible mask-less technology reduces expensive clean room space requirements by about 25%, and provides more redundancy and scalability than those industries currently have. The advantages of process control apply to the potential applications as well. In combination, the markets seem like logical diversification options and excellent ways to leverage the systems innovation abilities that Creo possesses.

The truly attractive aspect of this direction is that much of the R&D has already been funded by the DuPont color filter project. At least half of the estimated engineering will have been completed, and Creo possesses complete freedom outside the color filter market to look for additional applications for the basic technology platform. The leap in investment comes when Creo commits the full scope of the company’s resources to a particular industry. Creo needs to be interfacing directly with the potential customers in the new markets. Creo Product Managers need to assess requirements and Creo engineers need to do detailed analyses of existing processes to see how they can be bettered. The one downside of the DuPont partnership is the distance it creates between Creo and the end customers. This distance and the reluctance of Creo’s top management are preventing a more aggressive investigation of the other industries.
One could argue that Creo’s C-suite is being prudent by not going after the market aggressively, but it can also be argued that they have not provided the resources to truly even evaluate the opportunities.

Without a more detailed understanding it is easy to hypothesize, but hard to truly estimate, the returns of these other, more speculative, industries. However, Creo is approaching saturation in a market where it will have captured the most it can realistically ever hope to capture by sometime in 2008. As stated before, Creo will have to choose between attacking the broad graphic arts market and switching industries in order to create opportunities for growth. Going in the direction of a new industry does not require any of the monumental changes in structure that would be necessary if down market was the chosen direction. The R&D teams are perfectly capable of assessing the new set of problems a new industry would pose. Some industry specific expertise would be necessary, but these experts could be brought in to help teach the rest of the organization what the key issues in that industry are. The manufacturing team’s current flexibility and responsiveness fit very well with the idea of providing cutting edge platforms to change an entire industry. The marketing department could stay structured as it is and begin to tackle learning the best way to communicate the value proposition of Creo’s offering to the new industry. Finally, the sales team would require some adjustments. Since Creo would be selling equipment to very large manufacturing organizations, high end strategic account managers would be crucial. Creo has a good track record finding and retaining this kind of salesperson. Providing consumables in these more exploratory industries would be a major challenge as well, but keeping the knowledge in-house would actually enable Creo’s success in creating an overall system that is better than the current technology by providing more control of all the system variables.

5.3 Conclusion

Creo is a company that still has a lot of potential. The engineering talent clustered in the company is quite phenomenal. Having the CTO still active and engaged in many of the technical problems of the product teams is a boost not only in brainpower, but also in morale as people get excited to work with the dynamic and charismatic Dan. However, the company is showing some of the hesitancy of an adolescent. It is poised to grow, but not sure which direction to take. The hesitation is just time lost and decisions delayed, and the core recommendation of this analysis is simply to decide one way or another.
Once the decision to go down market or head into a new industry is made, then the company needs to get itself in tip top shape before tackling the challenges before it. Most of the necessary changes have to do with refining its sales and marketing efforts, but other important issues need to be dealt with as well. One of these is a marketing campaign against third party service organizations who are attempting to steal away service contract work. Discrediting these organizations will be beneficial on a number of levels. First, it protects Creo’s service revenue; second, it protects some of Creo’s intellectual property; and third, it highlights the need to improve efficiencies in the service organization to streamline the cost structure and reduce prices while maintaining profitability.

The other major area that needs to be addressed is employee morale. Their feelings of trust and opportunity need to be restored. While not completely eradicating the distaste of the economic impacts that the employees have felt, it would create a less divisive and more optimistic view. The trust issue needs to be addressed in a series of dialogues where the C-suite talks directly to the employee base about some of the problems it is dealing with at that time. The aim is to shed light on the problem solving process for the executives, hopefully building faith and credibility. These sessions will also elicit ideas about those selfsame problems that the leadership may not have. The sessions will also provoke conversation about other topics on the minds of the employee base. If the leadership stands up in front of the workforce and is forthright about concerns and mistakes, it should foster the trust of the employees so that they would speak up without fear of reprisal. This campaign of open communication is the best path to restoring trust at the company.

Opportunities for employees should be addressed in a different manner. Two historical roles at Creo that have become less well-defined and accountable than they used to be need to be refocused on mentorship activities for the company. People in these roles, section heads and Principle Engineers, should be held accountable for their performance as mentors. Fostering growth activities and holding employees accountable for their own development in their yearly reviews will reinforce the importance Creo places on continued improvement. Stagnation is not acceptable for anyone. Training opportunities should be pursued, books should be purchased, and skills should be acquired and practiced. This process also exposes the people and the company to new ideas which can be implemented in the company, again leading to a better performing organization.

Addressing these two weak points should help restore the feelings of faith and loyalty that Creo has engendered in the past. This commitment used to make a difference everyday as
people went the extra mile to fulfill their responsibilities. The executives at Creo need to remember that they need to go the extra mile for those people when difficult decisions need to be made.

The decision of whether to pursue the broad printing market or expand into new industries is not an easy decision, but the better option is clear. Creo needs to expand into new markets.

The low end of the graphic arts market is not big enough to contain a company of Creo’s size or ambition. Additionally, the growth afforded to Creo by going down market will only sustain the company for a short while, and the changes necessary to win that market would hobble its potential for future growth. From a fundamental perspective, by going down market Creo would be commoditizing the graphic arts industry even more. System robustness is potentially the only differentiator at the lower end of the market, but it may not be technically achievable. If it is not, Creo will have focused on a market that will not be very profitable. Finally, the organizational problems of going down market are potentially even more challenging than the challenges of Creo’s other alternative.

In contrast, growth opportunities in the new industries are, at minimum, on par with those in the broad printing market, and potentially much larger. Additionally, although the technical challenges of a new industry are daunting, expanding into a new market hones the organization’s skills and abilities of innovation. The CEO, Amos Michelson, quotes his principle tenet of business: find a unique, sustainable, and differentiating value proposition. Going into the new industries is actively searching for opportunities to differentiate and for new ways of creating value. Having addressed the other major issues hampering Creo’s efforts in its traditional market, Creo should then take the plunge and begin actively exploring new industries in which it can leverage the technical expertise of its product development groups.

Three stages to success lie before Creo. Stabilizing its revenue base through some marketing efforts will please the shareholders. Focusing on its employees will help motivate them and improve morale. After rebuilding this base of support, Creo will be ready to tackle new industries, develop new technologies, and become world leaders at digitizing physical processes. People often think the world’s focus on the rise of the internet and virtual life signals a shift away from the physical, but Creo is poised to turn that idea on its head and bring the digital realm to reality.
## Creo Inc.
### Consolidated Balance Sheets
(in thousands of U.S. dollars)

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**Table 3 - Three Year Consolidated Balance Sheet**
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## Table 5 - Three Year Consolidated Statement of Cash Flows

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<td>Inventories</td>
<td>5,869</td>
<td>41,886</td>
<td>5,227</td>
<td>4,719</td>
</tr>
<tr>
<td>Accounts payable</td>
<td>(4,527)</td>
<td>(33,939)</td>
<td>(3,784)</td>
<td>(2,928)</td>
</tr>
<tr>
<td>Acquired and other liabilities</td>
<td>2,848</td>
<td>(11,274)</td>
<td>3,236</td>
<td>(5,932)</td>
</tr>
<tr>
<td>Income taxes</td>
<td>(2,653)</td>
<td>(4,079)</td>
<td>(1,847)</td>
<td>(2,076)</td>
</tr>
<tr>
<td>Deferred revenue and credits</td>
<td>(7,625)</td>
<td>(6,724)</td>
<td>(7,576)</td>
<td>(1,314)</td>
</tr>
<tr>
<td><strong>Cash provided by Investing (used in)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Purchase of intangible assets</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Purchase of investments</td>
<td>- (5,000)</td>
<td>- (23,627)</td>
<td>- (1,992)</td>
<td>- (136)</td>
</tr>
<tr>
<td>Proceeds from investments</td>
<td>- (11,900)</td>
<td>- (2,547)</td>
<td>- (86,376)</td>
<td>- (1,278)</td>
</tr>
<tr>
<td>Repayment of promissory note</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Acquisition, net of cash acquired</td>
<td>(8,130)</td>
<td>(32,116)</td>
<td>(4,770)</td>
<td>(19,365)</td>
</tr>
<tr>
<td>Other</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Cash provided by (used in) financing</strong></td>
<td>1,209</td>
<td>7,259</td>
<td>1,209</td>
<td>2,263</td>
</tr>
<tr>
<td>Purchase of capital assets</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Proceeds from sale of capital assets</td>
<td>138</td>
<td>290</td>
<td>270</td>
<td>70</td>
</tr>
<tr>
<td>Proceeds from sale of capital assets</td>
<td>1,754</td>
<td>(2,802)</td>
<td>1,565</td>
<td>(377)</td>
</tr>
<tr>
<td><strong>Cash provided by (used in) financing</strong></td>
<td>(6,238)</td>
<td>(39,628)</td>
<td>(4,924)</td>
<td>(29,111)</td>
</tr>
<tr>
<td><strong>Cash provided by (used in) operation</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Change in operating assets and liabilities</strong></td>
<td>19,326</td>
<td>48,477</td>
<td>2,981</td>
<td>2,749</td>
</tr>
<tr>
<td><strong>Change in investing (used in)</strong></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Change in financing</strong></td>
<td>1,209</td>
<td>7,259</td>
<td>1,209</td>
<td>2,263</td>
</tr>
<tr>
<td><strong>Total change in cash</strong></td>
<td>20,535</td>
<td>56,736</td>
<td>5,260</td>
<td>5,006</td>
</tr>
</tbody>
</table>

APPENDIX B – FINANCIAL RATIO CHARTS

Figure 4 - Three Year Financial Ratio Trends

Figure 5 - Three Year Financial Returns
Figure 6 - Three Year Price to Earnings Ratio Trend
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