The MIT Integrated Supply Chain Management (ISCM) Program
Confidential Research Site Visit Summary

eClockspeed Site Visit to Helix Technology

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1. Event Background and Session Summaries

1.1. Participants

Helix Technology Participants

Janet Rosa	Supply Chain Director
Robert Anastasi	Executive Vice President
Bob White	Chief Information Officer
Tom Mahan	Vice President – Product Center (Mfg)
Ray Owen	Vice President – Global Customer Support
Bill Knuff	Director – Global Support Operations
Scott Thurber	GOLDLink™ Marketing
Mark Jalbert	Vice President of Sales
Dave Arthur	GOLDLink™ Product Manager
Sande Gilbert	KPMG IT consultant
Lawrence Wong	Supply Chain Manager

ISCM Participants

Li Yan	Avaya Corporation
Joe Bellefeuille	Lucent Technologies
Larry Buchanan	Monsanto
Mike Friedman	Procter & Gamble
Lori Folta	Transentric

MIT Participants

Prof. Charlie Fine	Professor – Sloan School of Management
Dr. Elaine Savage	Industrial Liaison Program
Jim Rice	Director – Integrated Supply Chain Management Program
Ed Schuster	Director – Affiliates Program in Logistics
Stefano Ronchi	Grad. Student (visiting from Politecnico di Milano) – ISCM
Derrick Redding	Grad. Student – MLog

1.2. Purpose

The eClockspeed Research Site Visits are a key ISCM research activity, intended to serve two key purposes for the researcher, Prof. Charlie Fine and the hosting company, Helix Technology:

- To apply principles and analytical tools as described in "Clockspeed" by Prof. Charlie Fine to Helix Technology's current business situation and supply chain, as Helix considers the issues associated

with redesigning the supply chain from a product orientation to service orientation. Applying Prof. Fine's research in this way provides real-time analysis and feedback to Helix Technology's leadership.
- To learn about current business dynamics at Helix (industry dynamics and structure, application of information technology for supply chain design and competitive advantage, etc.) that may inform the researchers about new phenomena to consider and possibly study, and to better understand the impact of new technologies on Clockspeed principles and analytical tools.

The eClockspeed event was sponsored and supported by the MIT Integrated Supply Chain Management (ISCM) Program, and each ISCM sponsor was invited and welcome to attend. In doing so, the event also intends to provide valuable learnings to ISCM sponsors. The ISCM sponsors learn about the latest supply chain design research from Prof. Fine and its application. Additionally, the sponsors benefit by learning about another company's supply chain redesign efforts and issues, as well as observing first-hand how Prof. Fine applies the Clockspeed tools to practical supply chain design cases.

1.3. Process

The 'Current Best Approach' for eClockspeed Research Site Visits (see Appendix) was used for the visit to Helix.

The eClockspeed visit entailed a single-day visit to Helix, starting with a facility tour and an overview presentation on Helix and the specific business case. After the introduction, a discussion between Prof. Fine and the Helix leadership was followed by a presentation by Prof. Fine on service operations and the latest 'eClockspeed' developments, based on the discussion topics and issues surfaced. The presentation resulted in application of some of Prof. Fine's analytical tools to the Helix case and substantive discussion among the Helix leadership team about the evolution of the company as well as the impact of the potential changes on the business.

This reports on the event and the process through the following sections:
- The Helix Case
- Customer Service Operations Analysis Presentation (Prof. Charlie Fine)
- Analysis of the Helix Case
  - The Opportunity
  - Analysis of the Helix Case: Service Management, Clockspeed
  - Issues and Questions
- Summary – Discussion of Learnings & Takeaways, Next Steps

1.4. The Helix Case

Business Description

Helix Technology Corporation is a $250M public company. Helix is a world leader in the development and application of innovative solutions in the field of vacuum technology. Helix has distinguished itself by utilizing proprietary technology and by leveraging a world-class lean manufacturing capability. Helix also provides its customers with benchmark global customer support.

Helix products are an important element in the operation of virtually every integrated circuit production facility (also known as 'fabs' – semiconductor fabrication facilities) in the world. Helix designs and manufactures component capital equipment to provide the vacuum technology required for semiconductor, flat panel display, magnetic recording head, and magnetic and optical storage media and optics production. The product includes cryogenic pumps, controls, compressors, and gauges, and Helix's market share is 85/90%.

The new components are generally sold to OEMs who in turn sell the assembled process tool to the end user customers. Examples of OEM customers are Applied Materials, Varian, Axcelis (formerly Eaton Corp.), and examples of end user customers are Intel, Motorola, and NEC.

Helix operates globally with worldwide headquarters in Massachusetts and manufacturing locations in Massachusetts and Colorado. In addition there are North American sales and service offices in Austin, TX and Santa Clara, CA. Sales offices in Europe are located in the UK, Germany, and France, with a service tear-down and assembly plant also in the France location outside of Paris. Sales offices in Asia and Japan are a combination of Helix owned and joint venture arrangements. Taiwan and Japan are Helix owned sales and service locations. Singapore and Korea are joint venture sales representative locations.

The classic service model is as follows:

- OEM offers component inventory and consulting support for the entire tool, usually contracted with the end user customer, per fab, on an annual basis.
- The end user fab location has generalist technicians on site to manage the tools and labor to change out equipment as needed or following planned maintenance schedules (PM's).
- The end user minimizes the access to fab locations from the OEM in an effort to retain process recipe proprietary information. The OEM has only the necessary information to deliver an appropriate tool design and no more.

- The component manufacturer (Helix) has the highest technical capacity and focused high vacuum expertise and is called on directly by the end user for consulting and maintenance support. This firm also performs material upgrades and rebuild and repair operations with a dedication to serving the end user location promptly and efficiently. Helix has a dominant market share (85 – 90%), held for greater than 20 years, resulting from this unique customer dedication and responsiveness, and consistently high quality equipment with extremely reliable performance.

The Product

Helix GOLDLink™ offer is as follows:

- Controls are built into the product. [OnBoard™ control capability was added to the product line and rolled out in the late 1980's. Today this product line represents >85% of all cryopumps sold.]
- Infrastructure is installed at Helix' expense (approx. $40,000 – 80,000 per site)
- Product has Internet-enabled remote performance monitoring. [The GOLDLink™ analysis team today can monitor, report and recommend actions on the integrity of vacuum or "cryo wellness" indices and the availability of vacuum via temperature conditions.]
- Information provided at the fab manager's desktop via internet. [Information without suiting up, entering clean room environment to visually inspect data, to develop the analysis and assess the current state. The proactive nature of the GOLDLink™ analysis advises fab manager of current performance against indices and the predicted performance for a number of weeks.] Actions recommended and alerts protocol followed.

The Situation

Helix Technology is revisiting its goals and strategy with interest in developing a synchronized roadmap to deliver total customer solutions for the OEM customer and the end user customer. These are in the context of Helix's view of its situation (from several perspectives, including current state, ideal state, and a future state):

- Current State: Helix sells products to OEM customers with the intention that the customers will have "no other choice" but to use buy Helix products for their OEM Product. Helix provides exceptional service through their GUTS – Guaranteed Up-Time Support which s a commitment to provide a solution to each problem within 59 minutes, every day of the year, 24 hours a day. Helix experiences a high rate of product returns that are not (over 25% of returns) due to a Helix product failure. To overcome this problem and to provide a better service to the customers, Helix developed GOLDLink™ (Global Online Diagnostic Link) monitoring the vacuum systems used in front end by their final users (2nd tier customers).

- Ideal state: This state would look like Helix controlling the extended semiconductor capital equipment supply network in the vacuum domain; they could do that as they have a huge market share, the right infrastructure, and the competencies. Even today, the end users call directly Helix to

solve problems ("we work on the problem regardless the cause"). In this way, they would move from a products oriented company to a service oriented company basing its competitiveness on knowledge and competencies.

- Future state: This would look like Helix improving the IT infrastructure, data acquisition, and web-enabled Helix global integration (Global Information Systems run by JD Edwards) to provide the services both to first tier customer and final end user customers. Helix does not have plans to disintermediate completely first tier customers (fab line OEMs).

- Product Situation
  - GOLDLink™ technology has IT superiority in the marketplace. Helix has the lion's share of the high vacuum market and the technology in place to enable analysis.
  - Expectation is for the basis of Helix Technology Corporation to change away from a product driven and highly cyclical business to a services company.

Issues

- Helix is competing with the OEM total tool service agreement (traditional) to pursue the Vacuum service and GOLDLink™ offering. For some customers Helix will pursue the same "pull-through" tactics from the end user successfully deployed for OnBoard™ market creation in the late 1980's. In other relationships Helix will generate market demand integrated with the OEM offer because no one will offer Helix' vacuum expertise, service excellence and integrated GOLDLink™ capability.
- GOLDLink infrastructure requirements are met through a combination of internal resources (primarily) and 3rd party capacity.
- GOLDLink installed base has expanded rapidly during the past 12 months on an assessment to pay plan. Only one or two customers have converted and finalized payment agreements to date. Helix sales team is aggressively pursuing GOLDLink™ installations and contract agreements in 2001.
- Helix worldwide logistics infrastructure is regional and needs a global strategy and implementation plan. The current capability is a complex bottoms-up infrastructure, established to support the company's 'non-negotiable' (providing everything a customer requests, all the time, whatever it takes to meet their needs) customer support dedication and GUTS, or "Guaranteed Up-time Support." Helix has historically guaranteed a solution to any problem diagnosed and communicated within 59 minutes, 24 hours per day, 365 days per year. The Global Logistics Strategy will be developed in a synchronized fashion with the design of the business requirements and performance needs of the company.
- Background: Helix manufacturing operations in MA, CTI Cryogenics plant, made a complete transition to demand flow in 1990. Since that time, the lean toolkit for supplier management, line balance, embedded quality, standard operations, visual work instructions, and unit-of-one demand pull make to order have been the fundamental operating style. Similar techniques are now utilized in

CO Operations and the repair operations in France, Taiwan, and soon Japan. One more tool, Value Stream Mapping will be introduced in Q1 2001. At recent levels of production during 2000, Helix met the current capacity within the CTI plant. CTI operations management believes there is opportunity to significantly increase the capacity by eliminating non-value-adding activity defined through the Value Stream Map.

1.5. Customer Service Operations and Clockspeed Presentations

Professor Charlie Fine of MIT reviewed his recent work Customer Service Operations Analysis, in addition to sharing new developments and additions to his Clockspeed analytical tools and principles. These were particularly pertinent given Helix's product-to-service evolution.

Customer Service Operations Analysis Presentation

Prof. Fine started his Customer Service Operations Analysis presentation by contrasting service supply chains from product supply chains. He introduced four main characteristics of services that serve to define and distinguish services from a product supply chain (for additional detail, see Power Point slide presentation slides by Prof. Fine):

1. Intangibility – There is an intangible (implicit and explicit) quality to service, whereas physical product is far more tangible with well-defined specifications and characteristics. It is more difficult to design for intangibles, and intangibles are generally difficult to measure.
    - Explicit and implicit intangibles. The explicit intangibles may be stated or committed customer benefits (i.e. satisfaction guaranteed). An implicit benefit may be one that the customer infers (i.e. customer can be confident knowing that the supplier guarantees satisfaction).
2. Perishability – Service cannot be stored – it is ephemeral and if not consumed, it perishes and cannot be recovered. (I.e. A hotel room or airplane seat not used is a wasted and lost resource that cannot be kept in inventory if unused; an airplane left on the ground waiting for spares represents lost (and expensive) flight time).
3. Heterogeneity – While there is variation is all supply chains, inherently, there is more variability in each service operation. The additional variation comes from the additional source of variation – the server or the deliverer of the service (this is not a source of variation for manufacturing operations).
    - For service operations, each service delivery experience is different, making it more complex to maintain standard service quality.
    - The heterogeneity of human behavior is difficult to manage. For service operations, multiple servers often deliver the service (i.e. there are many different servers in each restaurant, every physician's bedside care is unique), adding another source of variation.
    - Additionally, different customers place different values on the service, so 'service' often ends up as a customized product for each customer.

4. Simultaneity – Service is simultaneously produced and consumed, so there are fewer opportunities to use quality control and inspection process to ensure satisfactory experience. It is not possible to take back a poor service experience (i.e. a poor attitude from a server; an unsatisfactory service call at a customer).
    - Makes it nearly impossible to inspect prior to delivery
    - In a service business, one cannot separate the server from the product as the server and the human element are simultaneous. In a product environment, the product is literally boxed up and separated from the persons producing the product, and the customer gets only the product and not the service, the human interaction.

Prof. Fine also introduced some general points about services:

- All chains are both services and products chains.
    - In particular, services are more sustainable than products.
- Service operations entail dynamic interactions or 'encounters':
    - Not just between the customer and the company but between and among three parties (the encounter):
        - Management, Server, Customer
        - The server is central to the system, the link between the customer and the company, the point of customer interface. Historically there has not been a close relationship between the company and the customer, so the opportunity is to use the server to close the loop between management and the customer.
    - The interactions are complex and involve factors and feedback processes that are not immediate, effectively making service delivery a system to consider both short and long term impact and processes.
    - The intangible nature of the 'encounter' makes it difficult to concept test
    - The simultaneity and variability make it difficult to test market
- In a product environment, QC and inventory are used to separate the links in the supply chain, separating the human interaction from the product.

Prof. Fine introduced a useful analytical process that entailed considering and contrasting the tangible and intangible characteristics of the particular product or service. Designing for intangible characteristics is very different than designing for tangible characteristics, and both tangible and intangible characteristics are required. This exercise was carried out in the session (see Section 1.6 for analysis details). Applying this method in general would entail describing the tangible and intangible nature of the service that the company delivers. As an example, such a listing may look like the following:

The services that ABC Company delivers are:

Tangible	Intangible
Service via e-mail	Predictable information online
Service at defined time	Predictability of service
Analysis of problems in written report	Confidence that problems are being identified
Availability of spares	Confidence there will be min-no downtime

This analysis helps illustrate the importance of designing the service supply chain to deliver the intangibles as well as the tangibles.

Customer segmentation is important as it enables the organization to potentially provide different levels of service to different customer segments. The example provided was how Alaska Airline provides a very high service level. Alaska Airline provides two processes for serving their customers – one entails a self-serve kiosk for those customers desiring fast service, and another entails a human agent for customers with high-maintenance requirements.

Prof. Fine also discussed service quality and defined quality as being the difference between customer perception of quality and customer expectation of quality. The perception and expectation are affected by several factors to consider. In assessing ways to improve quality, Prof. Fine introduced 5 gaps to consider:

- Gap between consumer expected service and management perceptions of consumer expectations,
- Gap between management perceptions of consumer expectations and translation of perceptions into service quality specifications,
- Gap between translation of perceptions into service quality specifications and service delivery,
- Gap between service delivery and external communication to customers, and
- Gap between consumer's expected service and consumer's perceived service.

Strategic Supply Chain Design (eClockspeed) Presentation

Prof. Fine briefly introduced some of the more recent developments in his Strategic Supply Chain Design (eClockspeed) presentation. Specifically, he discussed how faster clockspeed industries made for less fruitful collaboration among companies than for companies in slower clockspeed industries. He cited the indicative comment by Sun Microsystem leadership indicating that collaboration was a key to Sun success, and that Sun was at the same time highly flexible, illustrated by Sun's ability to change any supplier in 6 months. The contradiction implied is that true collaboration entails a long-term relationship, not possible if all supplier relationships could be summarily ceased in 6 months. This is no surprise in the computer industry, as the scope of the companies' supply chain continues to evolve. The expanding and contracting scope of their business makes it difficult for the company to remain focused on core competence, difficult to build relationships, and near impossible to develop a 'common' understanding that stays 'common' (i.e. not changing). Instead, the companies expand and contract their supply chain capabilities, often crossing over into supplier or customer business domains, conflicting or at least confusing their external relationships.

There are many commonalities between service supply chain design and product supply chain design, yet there are many unique differences. The area of service supply chain design remains an area to be further examined and Prof. Fine expressed an interest in working with ISCM sponsors to study service supply chain design cases.

1.6. Discussion and Analysis of the Helix Case

The Opportunity

The Helix case provided a rich environment for applying Prof. Fine's Clockspeed concepts and Customer Service Operations Analysis work of late. There was unanimous agreement that Helix's shifting from a product model to a service model makes for an attractive opportunity for Helix to:

- Fully deploy GOLDLink™ remote diagnostics and service offering that will serve as a competitive advantage over competition for some time.
- Expand GOLDLink™ to become the master information source for end user customers.
- Leverage GOLDLink™ capabilities to become the coordinating entity for maintenance and uptime operation of semiconductor fabrication line operations, changing Helix's role from being part of a solution, to being the leader of a solution by providing with high-value fab line preventative maintenance planning and real-time monitoring and diagnostics.
- Shift from being a component manufacturer (Single, product-focused business) to a product and service provider (multiple product – hardware, software, services – and broad system solutions)
    - Such a shift also entails a change in the revenue model from generating revenue via the initial product sale and subsequent parts sales to OEMs, to generating revenue via ongoing service fees from the end user (subscription to or payment for Helix IT architecture and preventative maintenance services).

The strength of the Helix opportunity rests on multiple factors (some previously described in Section 1.4) including:

- Helix is the furthest along in developing an integrating IT infrastructure in the industry today
- Helix has strong brand name in front of end users today with nearly full presence on all fab lines with 85%+ market share in the installed base of semiconductor capital equipment in the vacuum domain.
- Helix is in a unique position with leading technology that could integrate and provide semiconductor fabrication line ('fab line') maintenance and operation leadership, and hence potentially play an industry leading role rather than its current role as preferred supplier of vacuum pumps and compressors for fab line equipment.
- High barriers-to-entry (BTE) exist with Helix's large installed base and strong user pull-through, making it difficult for OEMs to even potentially replace Helix as a vendor. It was estimated that it would take approximately 5 years for an OEM to replace Helix components on their tools if the OEM got really upset with Helix.
- Because of Helix's high market share, other component companies want to be associated with Helix as users consider that there is "no other choice" that to purchase Helix.
- High cost of downtime has resulted in a lot of inventory buffer at fabs, OEM and component manufactures, making Helix's potential offer to better predict downtime a way for users to reduce downtime as well as capital tied up in 'just-in-case' inventory.

- Helix has developed the right infrastructure, and the competencies to control the extended semiconductor capital equipment supply network in the vacuum domain.

Suggestions

In addition to the opportunity mentioned and described above, several suggestions were offered which are worth considering. Although these issues were discussed, they were not fully vetted in our discussions:

- Helix should consider spinning off GOLDLink™ from the Helix components company and operate it independently.
- Consider selling the services direct to end users on as many components as possible
  - Regarding selling and servicing the end user direct or continuing to go through the fab line OEM, one suggested to make the offer to both the OEM and end users and balance the commitment to each.
- In the extreme, Helix could give away the component(s) with the purchase of GOLDLink™ and rely on the service revenue stream as the main source of revenues.
  - What would the implications be to the supply chain design?
- There was some discussion that the service and pumps are two different products. Would it be worthwhile considering the two as the same product? With online monitoring capabilities of Helix products in use, the marketing message could evolve from "Helix products are world class products" to "Helix products and services can provide world-class fab line monitoring and diagnostics capabilities (Helix architecture powered and coordinated)."
  - This supply chain includes not only the monitoring, and predictive capabilities of GOLDLink™, but also the preventative maintenance information from the various components on the fab line. The monitoring could potentially drive an entire service and manufacturing supply chain at Helix.

Analysis

How could Helix take advantage of the opportunities, in consideration of their current supply chain, the current industry dynamics, and some of the issues presented? Prof. Fine introduced and applied several tools or discussion topics that appeared to provide useful insight into some of the design factors that Helix should analyze as it considers shifting to a service model.

We used the analytical process described in Section 1.5 to contrast the tangible and intangible attributes of Helix's product offering, segmented as follows:

Tangible Product Attributes	Intangible Product Attributes
Service via email	Confidence & hope for uninterrupted service
Notification of pending problems, root cause & recommendations	Predictability of service
Periodic status report on opportunities for user delivered via salesperson	Anticipatory information, before data is obsolete. "Your machine just went down"; "We know."
Availability of spare part	Zero defects that builds cherished trust
Heterogeneous data & analysis… humans involved with delivery & analysis (not automatic or standard), customers provided with data per their request, different people at customer may wish for different data	
Lower cost, cost reduction through the chain by operating lean	

As suggested in Section 1.5, this analysis makes it evident that designing a supply chain to deliver the intangible attributes of Helix's offering would entail a very different set of capabilities than are required for designing a supply chain to deliver the tangible attributes of Helix's offering. It would then be useful for Helix to understand how it currently delivers each of the different attributes, and then to consider how they would design the system to deliver the intangible attributes independently from the system that delivers the tangible attributes. (This is not to say that there should be two systems – it may be discovered that these attributes could be delivered more efficiently or effectively with independent systems or perhaps that the deliver systems may need to be integrated).

Taking this analysis further by considering the important new interface of the 'server' amid the customer and the company (manager), some important considerations emerged:

- Helix will need to value the customer relationship much more than it values the single transaction typically associated with the sale of a cryopump historically. Consider the server 'dynamic interactions' when designing the system.
- There is the need to segment the different customers and the different kind of services
- There is the need to define who is the server for Helix and who is responsible for providing the service. Today it is not clear today at Helix who provides: the role and opportunity of the servers: sales person, call center person, customer service engineer (CSE), other?
- There is a need to measure quality performance, especially what the customer perceived he/she wanted and what he/she perceived we delivered.

In addition to this analysis, the participants discussed issues associated with Helix's proposed shift from Product to Service. There were several healthy exchanges among Helix leadership examining what the prudent course of action should be, although there was not a full consensus to move ahead immediately.

The group discussed what Helix would need to do (building organizational capacity and skills) to make the change – much of these issues are documented in this section under "Issues and Questions to Consider."

Overall, the group appeared to use the day to develop a common understanding of the opportunity before Helix, discussing whether this was a prudent course of action for Helix and identifying some of the risk areas in making such a change. As noted, there was not full agreement among the Helix leadership that shifting to a service offering was the best choice for the business. The Helix team began to examine some of the requirements to take advantage of the potential – specifically, what would need to change, identifying the new skills and capabilities. Overall, the group succeeded at holding a meaningful, cross-functional discussion of Helix's future, using some new concepts and analytical methods to assist in their thinking and assessment. With the foundation of the Clockspeed and the Customer Service Operations Analysis concepts and tools, the discussion was especially focused and enlightened.

Issues and Questions to Consider

A number of issues were surfaced during the session, many are submitted here for reference, as these were not all comprehensively addressed and considered. They are presented here in the following categories:

Taking Advantage of the Opportunity
Fab Operator Perspective
Scope of Offering and Helix Capabilities to Deliver
The Process of Changing Helix's Business

Taking Advantage of the Opportunity

- Helix will need to move broader and faster while the window of opportunity is open – it won't remain open forever.
- Can Helix 'damn the torpedoes' and attempt to take the leadership position in fab line maintenance at the risk of alienating the OEMs? Is Helix the kind of company that can and would take this approach and make it work?
  - OEMs are likely to attempt to undermine Helix if Helix attempts to 'go around' the OEMs by offering a system solution direct to end users (fab line owners and operators).
  - The group estimated it would take Applied Materials about 5 years before it could completely replace Helix from its product line
  - What if Applied Materials were able to replace Helix as a supplier in much less than 5 years? Should Helix still attempt to take the leadership position?
- Helix now has a struggle between being a full-service company and a product company. The knowledge gap between what Helix has now as a product company, and what is required as a service company is significant. It would be useful to further examine the requirements to identify the gaps and the necessary actions to address the gaps and build the needed capabilities.

Fab Operator Perspective

- In order for Helix to be successful in selling their services to end users (rather than selling product to OEMs), the company will need to better understand the operating issues from the fab operator's perspective. Some of the pertinent questions are listed here.
- What are the main sources of downtime and unreliability at the line and tool level? Where is their main source of reliability pain that if solved, could significantly increase capacity?
- What components have the shortest maintenance cycles that drive the scheduled maintenance activities?
- Helix provides a critical component that every fab wants, but do the fabs view predictive capabilities on the pumps as a critical maintenance need?
- Do the fabs want a total maintenance solution or will they buy individual point, maintenance solutions?
- Is a direct approach to the fabs appropriate or should helix focus on being a partner in the "eco-systems" of after sale services that the OEMs offer to the fabs?
- At whatever level Helix chooses to support with GOLDLink™, can they sell uptime on that pump, system, tool, or line (like GE selling cat scan machines by scan cost instead of a machine cost)?

Scope of Offering and Helix Capabilities to Deliver

- In considering the opportunity for Helix to expand its product and service offering, the company would need to analyze its own capabilities to deliver. These issues were raised and some of the issues and questions are listed here.
- Is Helix going to be a provider of predictive services and repair knowledge for just Helix pumps, all cryogenic pumps on a tool, all pumps on a tool, all components on a tool, an entire line?
- What is the size of each of these levels of service (or what is the potential value add to the fabs if a problem were solved)?
- Can Helix monitoring equipment work with other pumps and components? Can Helix leverage their "pull" marketing ability with the fabs to require that Helix monitoring equipment be added to other components when the fabs buy new equipment with the OEMs?
- Shifting to a service supply chain may require Helix to value the customer relationship much more than the single transaction with customers.
- Can Helix offer world-class service on other mfg's components or tools?
- Is Helix the natural choice to become the expert in whichever level they choose to offer the service?
- Who else could offer this service?

The Process of Changing Helix's Business

- Helix may need strong, near Draconian actions to get the significant change required from the organization. In the past (such was the case during last major change), Helix CEO Bob Lepofsky fired everyone and required everyone to apply for jobs under the new organization that was subsequently created. With the market for resources very rich at present, and the market for Helix products very soft, the organization will likely be under great stress in apprehension of such Draconian actions. Helix has already gone to a reduced work week schedule (mandatory), as of yet avoiding layoffs.

- Can Helix quantify the benefits of a fab moving from reactive maintenance to preventative maintenance and from preventative maintenance to predictive maintenance?
- If Helix becomes a service partner of the OEMs, can Helix quantify the benefits of the value they bring to the fabs? Is it a large piece of the total value, or is it a small portion that doesn't help the OEM's value proposition?
- What is Helix's capacity for organizational change? I suppose if the CEO is willing to fire everyone, this question may be mute, however, the people who remain on board plus new hires still have to adjust to meet the market needs for this service?
- What is the right relationship to strike with the OEMs – should Helix collaborate and share the benefits, or should Helix attempt to lead and become the channel master coordinating the operations and decisions in operations of the fab operations?
- How does predictive capabilities change moving from a component level up to a system level (tool level and line level)?
- Management feels very uncomfortable with the potential changes of moving to a more service based organization.
- Once Helix gets clear on its business strategy – (Vacuum pumps and compressors, GOLDLink™) can the organization do both in the same organization? Should Helix separate out the different offerings (different operations for Vacuum pumps and compressors versus GOLDLink™).

2. Summaries

2.1. Summary of Learnings and Takeaways

The group identified a set of learnings for the day, and these are the largely unedited comments submitted by the participants:

- The role of the 'human server' is larger than originally understood, and leads the group to recognize the importance (and difficulty) of defining service requirements.
- Given enough time, any organization can catch up to the delivery of state-of-art information systems but it will take longer to develop human server capability.
- The Tangible – Intangible Exercise was enlightening, possibly useful for additional analysis and application. The exercise also helped identify clear difference between what made Helix successful in the past versus what is high potential in the future.
  - This is a threatening situation for the organization.
  - Design the services in order to be able to cope with variability and heterogeneity
- The complexity factor – Dealing with high complexity requires fuzzy (loosely defined) approaches that we engineers are not so highly skilled at.
- The group found the 5 gaps (described in Section 1.5) were useful to measure service quality.
- The Manager-Server framework helped illustrate a common problem when call center employees suffer from a lack of experience, especially when one contrasts the ability to deliver a consistent and predictable service experience via the GOLDLink™ automated process. An automated process

will be more predictable, although it may not provide all the necessary service and support required by end users. As was suggested in the example of Alaska Airlines, the optimal support system may be a combination of an automated process and a personal process (queuing or other means (pricing policy as an example) of managing demand for this level and type of service may be required).

- Service quality – can't be fully checked, once you go live, you're live!
- Segmenting customers and services for those customers – it is possible to utilize Web electronic systems to create ways to segment service (and charge appropriately).
- The information that Helix collects from fab line operations needs to be analyzed so that it is not just 'information' but instead it should be actionable information.
- The group seemed convinced that Helix should take advantage of a big opportunity where Helix also has high market share and end user pull, and move forward rapidly to implement GOLDLink™.
- The session reinforced the importance of connecting business strategy & supply chain strategy by illustrating how closely supply chain strategy is tied to business strategy. The strategic decision that Helix will make in considering a change to more of a service business would clearly have a significant impact on the way Helix would design its supply chain to deliver the necessary product attributes – tangible and intangible – of the Helix service offering.
- Helix is faced with new challenges requiring different capabilities. Given the market for personnel, this is a good opportunity in the current market, a good time to hire these new skills into the business.
- Helix feels the need to break the current organization, in order to allow it to grow.

2.2. Meeting Summary of Conclusion

Consistent with several of the previous eClockspeed Research Site Visits (P&G, Siemens Energy & Automation in particular), the event was deemed a success from several perspectives. The session:

- Brought Helix's leadership together to examine a critical issue for a balanced, informed discussion.
- Served as a way to raise the discussion amongst Helix leadership, and at a higher and more enlightened level using Clockspeed principles as useful, new foundations for discussion and consideration.
- Served as a catalyst for change at Helix, as Helix leadership began to vocalize their varying perspectives on the opportunities and challenges. The group had progressed enough in discussion to outline important factors to consider and have the issue become a central issue for discussion and decision-making in the near future.
- In a very brief time period (prework and one day visit), Helix was able to present an important issue – the strategic future and its impact on their operations and supply chain – and establish a common understanding of the opportunity, the issues, the risks as well as a language for discussing and considering the issue going forward.
- Introduced ISCM sponsors to another leading-edge case where a company is in the throes of redesigning its supply chain. In this case, Helix may be positioned at – or may create – an inflection point to change the industry structure and the role it plays in the world of semiconductor fab operations.

- Introduced ISCM sponsors to new concepts with examples and analytical tools from Prof. Fine. These were applied to Helix's case to illustrate how to use the analytical methods and tools as well as illustrating the potential usefulness of the methods:
  - New Clockspeed concepts, and
  - New Customer Service Operations Analysis concepts.

Going forward, Helix will continue with their analysis and progress towards a decision. Bob Anastasi and Charlie Fine expressed mutual interest in continuing this study discussion and will explore the possibility of studying the evolution and change at Helix as part of a research study.

3. Appendix

3.1. eClockspeed Research Site Visit 'Current Best Approach' (CBA)

Selecting Candidate Situations for eClockspeed Research Site Visit

1. ISCM sponsor should identify a specific business case or situation that relates to the supply chain where:
   - A decision is being made that will affect the design of the supply chain
     - Outsourcing part of the supply chain
     - 'Insourcing' part of the supply chain
     - Creating a virtual supply/value chain
     - Product is being redesigned
       - For supply chain efficiency (cost) or speed (time to market)
       - To facilitate outsourcing part or all of the supply chain
       - For product performance improvement
   - New initiatives developed to collaborate with suppliers and/or customers for improved supply chain performance
     - Extended enterprise™ supply chain strategy
   - The impact of the Internet and/or information integration on the business and supply chain are being explored
     - Use of marketplaces, exchanges as part of your supply chain design
     - Use of the Internet to facilitate collaboration among your supplier and/or industry
     - Strategy of developing e-business applications for the supply chain
   - There is significant change in the business driven by technology changes that will have an effect – albeit unknown effect – on the supply chain.

2. Willingness of the key decision makers and business leaders to discuss the issues

3. Willingness of the sponsor to host a limited number of representatives from other ISCM sponsor companies. The role of the visiting sponsors is one of listening and learning, with the main focus intended to be on the host site and the interactions with Prof. Charlie Fine in the application of the eClockspeed analysis (tools and processes).
4. Cases not suitable
   - Supply chain software installation with focused application and limited interaction with other aspects of the supply chain
   - Other

Preparing for the eClockspeed Visit

1. Prepare a written description of the business case, including
   - Basic review of the product line, business revenues, market positioning and overall performance
   - Listing of critical issues at present, noting the decision(s) that need to be made and the implications of the various choices on the supply chain design and performance
   - Description of the supply chain
     - Include a graphic showing significant supply and customer (channel) relationships from suppliers' supplier, through to customers' customer
     - Include internal manufacturing/service operations
     - Note the critical relationships, cycle times, ownership, and coordination mechanisms/processes.

2. Identify and enlist key business leaders to participate in the session. This should include a representative set of cross-functional leaders, preferably a natural work team fully represented. Success of the visit will depend on the ability of the business to get the critical leaders to actively participate and engage in the session with each other on this subject. It would be useful to make sure that this is a real-work session applying the Clockspeed concepts, processes, and tools to the business case and not a sit-back-and-listen session.

3. Come to agreement on the purpose of the meeting.

4. Familiarize all participants with the concepts in Clockspeed. Best done by reading the book! Each participant should have his or her own copy (we're not trying to sell books here) to ensure highest likelihood of being prepared.

5. Each participant should complete Recommended Pre-Work for Sponsor Participants in advance of the session. The sponsor site visit leader should then collect the input and map the responses in a meaningful way (depends on the input) as a foundation for the visit (not intended to dwell on this at the session). This process may illustrate some disconnects and/or conflicts with the current business strategy, supply chain strategy, goals and action plans among the various participants.

   <u>Recommended Pre-Work for Sponsor Participants</u>

   Each sponsor participant should prepare responses to the following questions, preferably with from previously prepared documents:
   - What is the business strategy?
   - What is the supply chain strategy and how does it support the business strategy?
   - What are your specific goals and key action plans and how will these actions support these strategies?

- Is the unique value of the product modular (i.e. connected to components of the product that can be separated) or integral (i.e. part and parcel of the entire product, not easily separated)?
- How are the competitors in the industry structured – vertically integrated or horizontally integrated?
- What is the business' selected e-business approach?
- Map the supply chain.
- Identify the key issues that the business should be working on at present.

6. It is helpful to prepare some graphics of the business' supply chain, the mapped responses and several of the key 'Clockspeed' concepts/processes (i.e. double-helix, product-process matrix) for visual reference for the participants.

7. It may be useful to arrange a conference call among the site host and those ISCM sponsors who have hosted eClockspeed visits to share learnings and provide a resource.

‘Clockspeed’ Descriptions

'Clockspeed' Review from Amazon by the author, Charles Fine
January 5, 1999

"I have tried to accomplish three things in Clockspeed: First, to build on the observation that not all of the economic acceleration we experience occurs at the same pace or in the same direction. (That is: Clockspeeds vary by industries, technologies, and organizations. Also, some industries (e.g., retail sales) may be atomizing due to a certain technological change, while others (e.g., infotainment) may be conglomerating.) Second, I have tried to build an analogy to biology where the study of rapidly evolving fruit fly colonies often unlocks secrets of human evolution and genetics. I argue that some observations from the industrial fruit flies (fast-clockspeed companies and industries), in fact, do reveal useful rules of industrial evolution that will carry over from the industrial age to the information age. (Some value chains are made up primarily of electronic bits. Others are made from chunks of bricks, mortar, and steel. Most have a combination of bits and chunks. Regardless, critical decisions must be made about which pieces of your chain you choose to try to master and which you outsource to others.) Third, I have tried to highlight the concept of "supply chain design."

I believe that design of the chains and networks of organizations and capabilities that provide value to customers is a critical strategic orientation for business executives and economic policy makers. Along the way, the book offers lessons on insourcing/outsourcing, business strategy, concurrent engineering, public sector institutions, and forecasting future rates and directions of industrial change. The book attempts to take more of an eagle's-eye view than a worm's-eye view. As a result, the book does not try to explicate at great length recent phenonena such as eCommerce or the Internet. Rather, I use these among a set of examples of fast-clockspeed subjects - industrial fruit flies - worthy of observation and analysis."

Websites with reviews

http://www.bizjournals.com/atlanta/stories/1998/10/12/smallb7.html

http://www.fastcompany.com/online/19/lordflies.html

Day-Visit Draft Agenda

XYZ Product Team/Business Unit

8:00 AM-5:00 PM
Location

Participants:
- Leadership Team
- Prof. Charles Fine and other Integrated Supply Chain Management sponsor representatives

Objectives:
- Apply supply chain design concepts developed by Prof. Fine to the business case to develop new insights and solutions
- Continued research on how to enrich the supply chain design process to improve future application

Approach:
- Utilize a combination of internal company resources and tools with the external perspective of Prof. Charles Fine and ISCM Consortium members to address the specific issues identified by the company.

Agenda Flow:
- Introduce participants
- Review agenda
  - Confirm objectives
    - Company
    - Research team
  - Share expectations
- Background
  - Review the Business Case Review (Sponsor Executives)
  - Business, Industry and Product Structure
  - Current and future state
  - Identify critical business issues, opportunities and decisions
- Review of supply chain design concepts (Prof. Charlie Fine)
- Application of supply chain design concepts
  - In context of the Business Case
  - In context of critical business issues, opportunities and decisions
  - It may be helpful to separate the group into smaller breakout groups to map the supply chain, identify 3 key areas for the host company to work on
  - Summarize learnings and observations from participants
- Adjourn larger meeting