Tuck School of Business
at Dartmouth

ProdCo and the Magus Networker Problem-Solving Process (A)

ProdCo Technology Director Alon Johnson couldn't believe the reports his people were giving him. For the third straight quarter ProdCo was posting losses as a result of delays in delivering new products. The poor results were coinciding with an unprecedented spike in demand for the types of automotive products that ProdCo had specialized in producing for the African market for the past several decades. The numbers made no sense to the seasoned mechanical engineer sitting in his office at ProdCo corporate headquarters in Johannesburg, South Africa.

Alon reflected on the actions that his technology team and the rest of the senior management had taken over the past year and wondered if there was some decision he could point to that led to this sudden and increasing drop in profitability for ProdCo. Alon knew Corporate was not going to be pleased with these types of returns for a third time. He could explain away a quarter or two of losses with changes in market conditions and unprecedented growth, but a third straight quarter of losses was going to be difficult for any of the senior management to swallow.

Alon had a week before his technology department, along with colleagues in R&D and production, would have to present to corporate management during the quarterly review meeting. He wondered what he could do to find answers before then and get ProdCo back on the track to profitability. As he gazed out his corner office window overlooking downtown Johannesburg, he recalled the seminar he attended on the applications of network analysis several years earlier put on by consultant Denis Bourne of Magus Toolbox. Alon recalled why Denis' seminar stood out in his mind:

> The general pattern with previous workshops is that 'loud voices' tend to dominate, and sometimes the conversations end up either in no agreement to take action, or the action that is agreed upon is either not implemented or it is wrong – or both. On this occasion, I observed two encouraging things. The 'loud voices' were less noticeable, and when they did pop up, many people would turn on them and point out that the data said something different.

He wondered how much time it would take to organize the heads of the departments and get Denis on the next flight from Paris to Johannesburg. Having made his decision, Alon began searching his Rolodex for Denis' business card…

ProdCo Background

South Africa-based ProdCo produced a variety of small manufactured parts for suppliers of the automobile industry and other engineering businesses throughout Africa. ProdCo had 7,000 employees in divisions based in Kenya, Mozambique, Namibia and Zambia, and a headquarters based in South Africa. The company was owned by a larger conglomerate, also based in South Africa, with annual revenues approaching $3 billion and 50,000 workers across three continents and 17 countries.

ProdCo had a long history of engineering excellence. It was founded in the early 19th century and quickly became a leading engineering firm, producing a variety of small manufactured products for several sectors in Africa. The firm's culture of engineering excellence had remained strong for decades. Most of ProdCo's senior managers had engineering backgrounds and tended to focus on the engineering aspects of their business. ProdCo's modern-day business model resembled that of some of its competitors in the automotive parts manufacturing market, including Perkins Engines in the United Kingdom and Cummings Engines in the United States.

Throughout ProdCo's history, the firm grew organically by expanding its engineering, R&D and manufacturing practices. However, in more recent years ProdCo began expanding through acquisition. The main driver for this break from tradition was an increase in demand for new products or variations on existing products from many of ProdCo's customers. The company was not entirely able to meet this demand with its existing structures and workforce and its management believed it could fast-track growth by acquiring some smaller competitors based in surrounding African nations.

As a result of the acquisitions in recent years, the organizational structures of ProdCo's divisions differed depending on the country in which they were based. Some had very hierarchical, top-down structures, while others had very flat/lateral structures. Management styles varied with the organizational structure in which they resided. Despite these differences, all of the divisions followed direction from the firm's headquarters in South Africa, which housed the technology and marketing departments, engineering laboratory and pre-production unit.

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ProdCo Organizational Structure
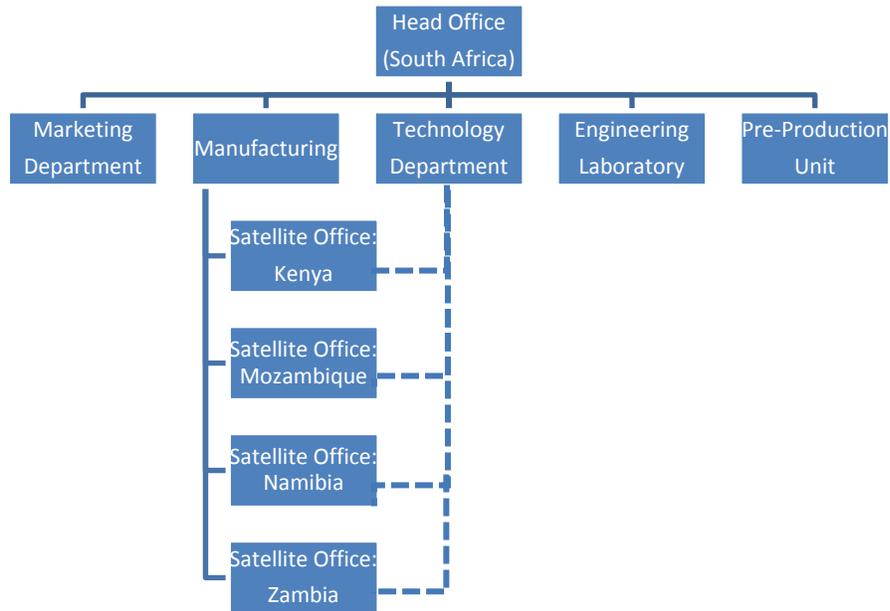
The Challenge in the Product Development Process

The product development process for all divisions within the firm followed a standardized path. The Technology department oversaw R&D and safety in all of ProdCo's departments. The company used the Laboratory for testing new materials and product designs. When a new product moved out of the development stage, it moved to the Pre-production unit where final testing of the product took place through a pilot production program. After a successful completion of this process, the product moved to manufacturing, which took place in several locations, including the headquarters in South Africa and satellite factories in Kenya, Mozambique, Namibia and Zambia.

ProdCo Product Development Process

- **New product development**
- **Testing & finalizing in a pilot production program**
- **Manufacturing in the main factory & satellite offices**
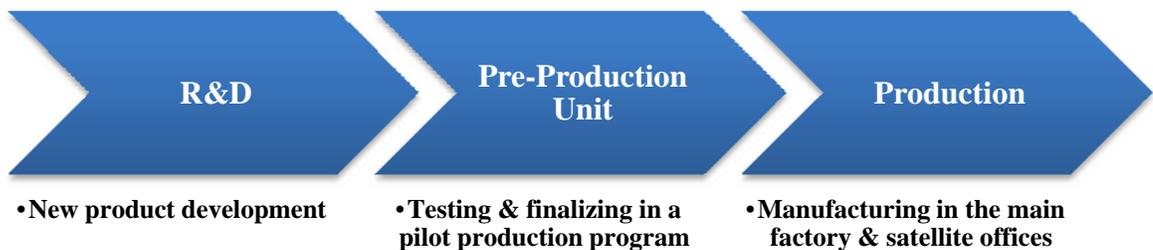
Throughout the decades of organic growth, the traditional product development process worked smoothly. ProdCo earned a steady stream of healthy returns and delivered innovative products on schedule, delighting its clients. Yet in recent years, ProdCo had faced new challenges: new demand for increasingly differentiated products, rapid growth through acquisition, and new legislation in South Africa on employee safety and product liability. As a result, ProdCo encountered a growing number of schedule and cost overruns in getting products to market. With the magnitude of overruns increasing, ProdCo posted quarterly losses three times in a row for the first time and customers began leaving as complaints rose over product delivery delays.

Every effort Alon Johnson and his technology staff had made over the past several months to track down and fix the causes of the overruns had met with at least partial failure. The exercises always began with a fairly traditional review of the formal procedures and practices that governed ProdCo's process of getting new products to market. Every review ended with the same result:

> On paper, the design was right, and everything appeared to be working according to plan and procedure, but for some unknown reason we're not meeting our time delivery targets.

In addition to missing product development and delivery deadlines, ProdCo was experiencing several other issues. Some employees complained that the organization was becoming too "busy" or "noisy" and that it was "too easy for people to make mistakes." Others expressed some "confusion over the approach to developing knowledge sharing, especially regarding new technology information." Yet others felt that "the company [had] too many operational problems that need[ed] to be resolved" and "too many operational problem-solving decisions [took] place at too high a level in the management hierarchy." Some of the research-focused engineers complained that "a few R&D programs appear[ed] to be not well aligned with the company's strategy." Lastly, a growing echo in the hallways harped on the fact that "resources were not well aligned with ProdCo's strategic priorities."

Alon suspected the roots of these issues might lie outside the formal structures and processes and that understanding the informal networks formed by the employees of ProdCo might help illuminate the problems and their causes. He remembered the seminar where he had met Denis a couple of years earlier. The seminar had focused on the fact that the informal networks within organizations sometimes had a greater role in how work was actually accomplished than the formal organizational structure. With this in mind, Alon tasked his senior review team to work with Denis to commission a study of the informal networks within the firm. The objective was to understand how informal networks were enabling – or disabling – ProdCo's processes.

The Challenge in the Technology Department

When Denis arrived at ProdCo's head office, he found Alon sitting at his desk. Alon invited Denis to sit down as he explained what was troubling him:

> The Technology Department has always had a broad set of responsibilities – not just research and development, but safety and product liability as well. When a customer encounters a product quality problem, they call Manufacturing, but Manufacturing quickly passes any product quality or reliability issues along to us. We are responsible for addressing any design issues that contribute to poor product quality, and for advising Manufacturing on continuous process improvement to reduce product defects. We are also responsible for tracking incidents involving employee safety and working with Manufacturing to remediate those issues as well.

> Last year, South Africa passed new legislation setting more stringent requirements for both employee safety and product liability. Our customers and regulators hold us to a higher quality standard than ever

> before. In response, the company formed a formed a small unit in headquarters to define a set of protocols that would enable ProdCo to meet the new requirement, and the Technology Department has had to become more proactive, taking pains to monitor compliance with the new regulations at every step in the design and manufacturing processes.

> This has slowed down our new product development process considerably. Now, to meet our customers' expectations for high quality, we risk disappointing them by failing to deliver on time. We are losing the competitive advantage that we had gained over decades…our ability to get new products out of the factory gate, quickly, on time and within budget.

Alon went on to explain that his team's three previous attempts to solve this problem using formal process reengineering methods had failed. He hoped that Denis would be able to identify the informal systems upon which the new product development process depended. If ProdCo could get a better understanding of these informal systems, it could potentially use that information to improve its production quality and increase the safety of its operations. He also hoped that Denis's work would help the Technology Department find ways to strengthen its working relationships with ProdCo's other engineering and manufacturing units all over Africa.

While Alon was interested primarily in the informal systems behind the new product development process, after a brief, front-end discovery stage, Denis advised him that it would be more informative to look at a broader range of processes throughout the ProdCo organization. The two agreed on a product scope that would include not only new product development and regulatory compliance, but also some key information flows, commercial risk, resource allocation, cost reduction, and the resolution of operational problems. The first meeting between Denis and ProdCo's management team went well, as Alon later recalled:

We set out with a belief that using Magus Networker would help us unravel the causes of a serious problem that had defeated our conventional approaches to dealing with it. Unraveling those causes would help us develop effective new solutions, and regain the competitive advantage that we had gained over years. The source of that advantage was our ability to get new products out of the factory gate, quickly, on time and in budget.

Apart from helping us tackle the specific problem, we also believed that using Magus Networker would help us improve the working relationships between our HQ in Johannesburg and the various engineering and manufacturing units in South Africa and elsewhere in Africa.

This we hoped would focus on the transfer of technology information around the departments, as well using that information to add value to production and a safer working environment.

Social Network Theory

Denis knew that several forces could be at play within ProdCo, based upon his deep knowledge of social network theory. Among these forces were the following:

- *The nature of the connections among ProdCo employees.* In considering a connection between two individuals, social network theory differentiated between "strong ties" and "weak ties." People who communicated with each other frequently, who discussed important topics with each other, or who felt a particular connection to one another were said to be "strongly tied," while those who communicated more casually or infrequently were said to be "weakly tied." Denis wondered, were ProdCo employees strongly or weakly tied with each other? How did tie strength vary within and among the company's various groups?

- *The structure of the interpersonal network among ProdCo employees.* A network in which a large number of individuals were strongly tied to one another was said to be characterized by closure. Such networks were described as having high levels of social cohesion; this contributed to shared norms and values, and sometimes to the successful nurturing and development of ideas. By contrast, other networks consisted of people who were largely disconnected from one another; an individual's strong ties were limited to a small clique of other people, and this clique was only weakly tied to the rest of the network, if at all. These networks were characterized as having structural holes, and the rare individual with ties to more than one clique could, in effect, bridge the structural hole between those cliques. This person could act as a broker, enabling the efficient transmission of information and ideas across great social distances, and sometimes garnering significant power by doing so. Denis sought to discover: Were ProdCo employees a cohesive group or one characterized by numerous structural holes?

- *The diffusion of information – particularly technology – through this network.* Research had shown that certain types of information passed most efficiently through weak ties, notably information which was well-documented or based on shared knowledge. More complex information required more time and effort to convey and was best transmitted through strong ties. Whether ProdCo employees were sharing information in the most

efficient way depended upon both the type of information and the nature of the ties among employees. How did they go about searching for and transferring information throughout the company, and how was this influenced by the structure of their network?

The Magus Toolbox Approach

Denis explained to employees that his firm, Magus Toolbox, followed a consistent process in every one of their client engagements. Specifically, Magus Toolbox took the following four steps:

1. *Specification.* The Magus Toolbox consultant would work with the client to agree upon goals. This agreement would specify deliverables, database design, and sampling plan for the survey.
2. *Configuration and collection of data.* Magus Toolbox relied on employees to generate data that would enable an evaluation of the network structure of the firm. The consultant would brief all survey participants on the survey process and objectives and would explain the "rules of the engagement." One rule was that a person had to complete the survey in order to take part in the discussion and interpretation sessions at the end of the engagement. Magus Toolbox insisted on this participatory approach in every engagement, not only because it led to insightful and revealing discussions, but because it had consistently produced around 95% participation by planned respondents.
3. *Interpretation and action.* The consultant would run some initial queries, then apply his past experience and his knowledge of social network theory to prioritize which results might be most meaningful for the feedback session. He would then facilitate a discussion session in which participants would view the results and interpret them. The consultant acted as a neutral party, explaining how the results were displayed but not making any sort of judgment, normative or otherwise, about them. All interpretation was up to the participants themselves.
4. *Implementation.* At the end of the discussion session, participants created action plans, to which both they and their managers would be held accountable through ongoing monitoring of results.

Magus Toolbox Engagement with ProdCo

A month later, Denis Bourne was riding in the car on his way back to ProdCo's head office campus. He turned his gaze away from the spring scenery outside Johannesburg to review the information and charts that Magus Toolbox had collected and organized for presentation to ProdCo's management and employees.

In the web-based data generation process, employees had been asked to list all other employees with whom they interacted on a generally important basis. This list of names became their personal set of choices for all subsequent survey questions. For example, employees could be asked to rank each of the people they interacted with by frequency of contact, as well as rating the importance of these contacts on a scale from 1 to 5.

The survey covered a range of communications pertaining to the new product development and compliance processes, either directly or via related topics. It specifically asked respondents to consider the value-added through working relationships that currently existed, which working relationships should be adding value but currently did not, and which working relationships currently existed but were unnecessary or even detrimental. For example, regarding new product development, employees were asked:

1. "With whom do you work where value is added to new product development?"
2. "With whom do you believe you SHOULD be working to add value to new product development but currently are not?"
3. "With whom are you currently working where value would be added to new product development if did not?

The following chart summarizes the scope of survey questions:

	Re: New product development	Re: Compliance with regulatory protocols
Working relationships that currently exist	Importance of the work done through the relationship	Importance of the work done through the relationship
Working relationships that should exist, but currently do not	Importance of the work that should be done through the relationship	Importance of the work that should be done through the relationship
Working relationships that should not exist, but currently do	Importance of stopping the work currently done through the relationship	Importance of stopping the work done through the relationship

These questions were selected by Magus Toolbox to reveal information about specific network issues. From the survey responses, Denis and his team utilized their proprietary network visualization software to graphically represent ProdCo's network structure.

The final stage of the process was a series of workshops with management and employees – open to anyone who had provided data on their working relationships. Denis was scheduled to lead the first of these workshops today. He would present a number of charts for discussion. The end goal of the workshop was to generate a list of takeaways and action items which management would commit to support. Denis and Alon viewed the workshop as a potentially useful and constructive process for many of ProdCo's employees.

This process had produced positive results for other companies in the past. A former client recalled his thoughts on working with Denis and the Magus Networker software:

I started out hopeful but skeptical, but as the day developed, I realized that not only me but others were becoming very energized by the process. By the end of the day, I had started to build relationships with people I previously knew but had more or less ignored. By the end of the day, I was convinced that the company would change for the better.
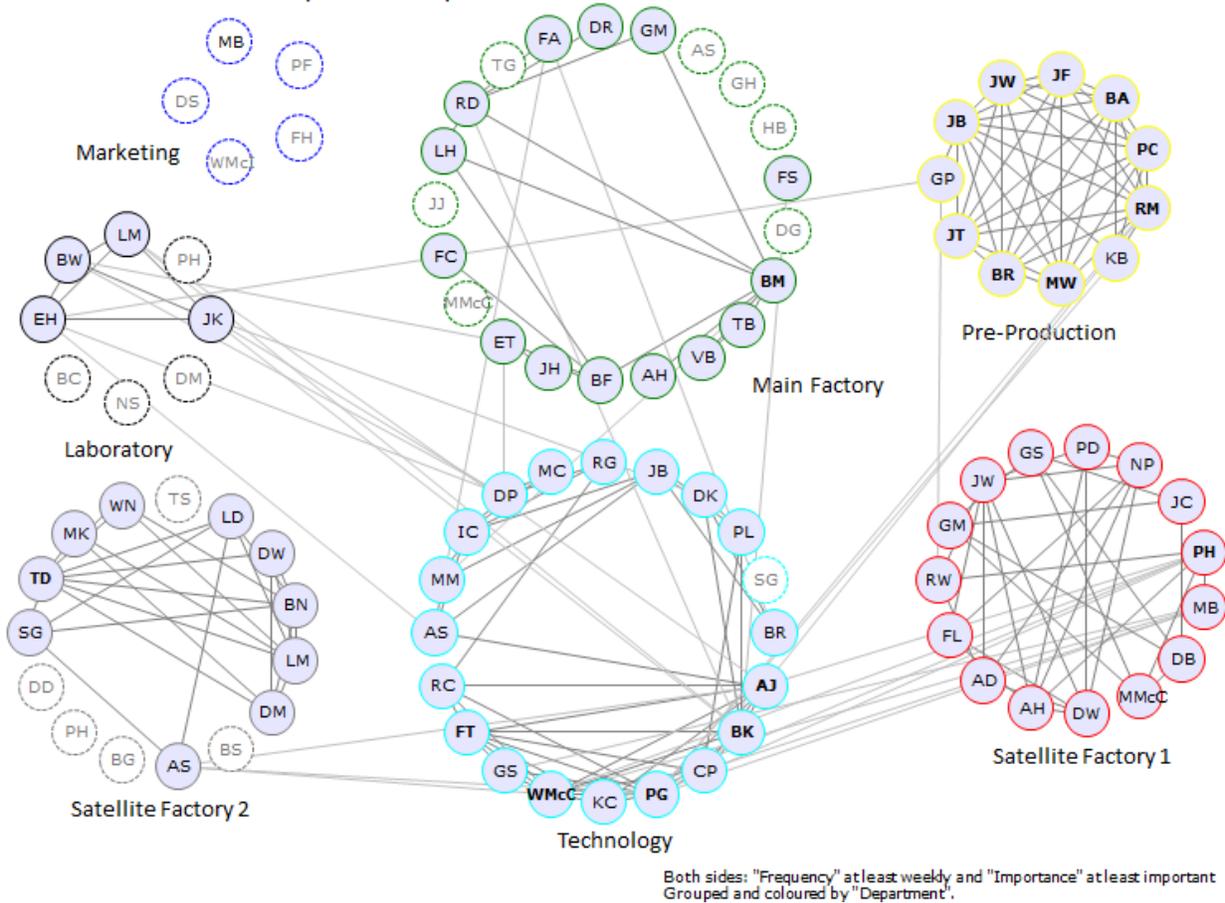
Denis and his team were always careful not to interpret the charts themselves. Experience taught them it was better for employees and management to come to conclusions on their own, no matter how obvious those conclusions may seem at first. Denis had brought a large number of charts with him for the ProdCo workshop, nearly 100 in all, but there were a few charts that Denis suspected that the participants might find particularly interesting.

Network Chart 1: All Agreed Links (Exterior Links Excluded)
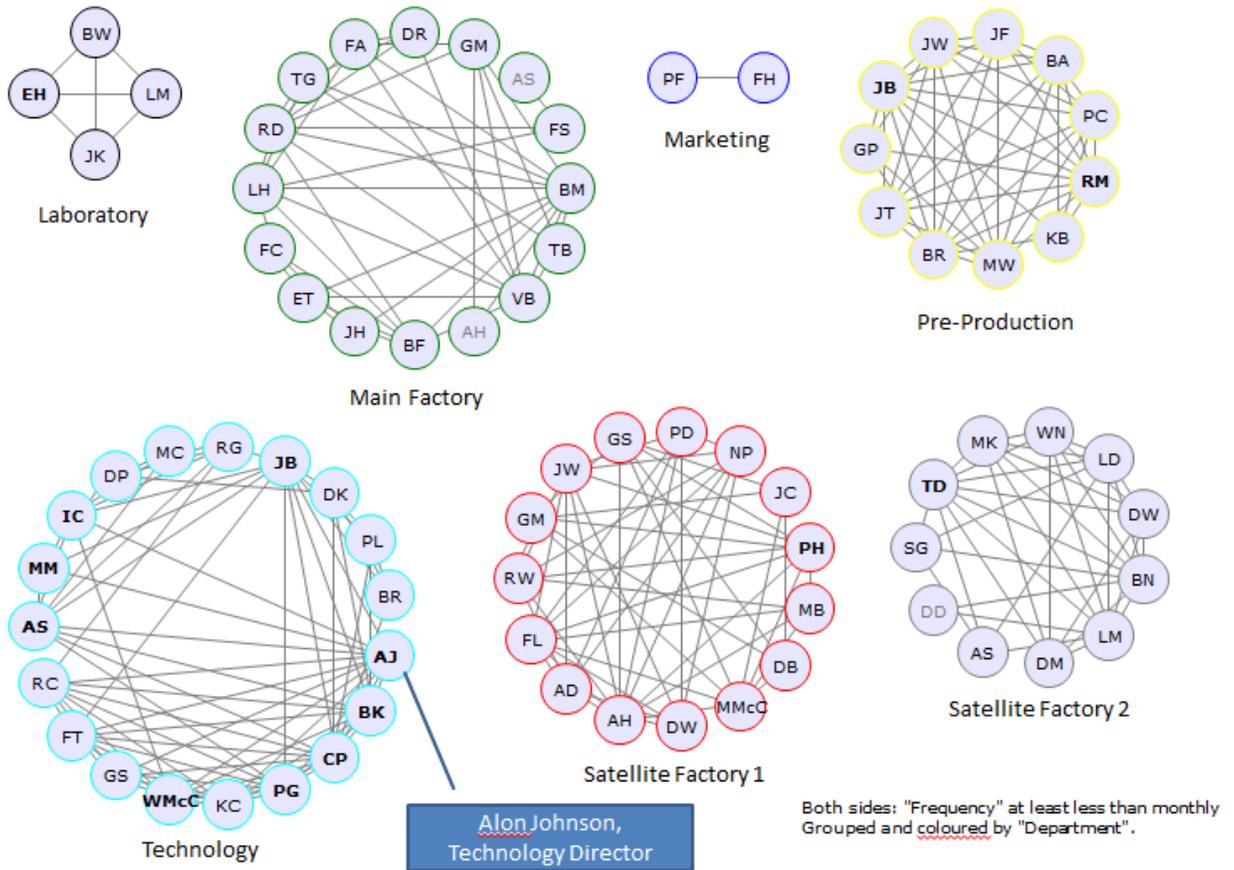
The chart above was intended to introduce the general layout and principle of the way that data would be presented. It showed all links with a frequency of at least "less than monthly." Each link was "agreed", which meant that both parties indicated the link existed. Exterior links – i.e., links between departments – were excluded from this chart, as were individuals who were "isolates" or had no agreed links. This chart, grouped into departments, illustrated the functional segmentation of the firm.

Network Chart 2: Frequent & Important

Both sides: "Frequency" at least weekly and "Importance" at least important
Grouped and coloured by "Department".

The chart above better illustrated working relationships, because it showed links which both parties had indicated as frequent and at least "important" on a 5-step scale. It included exterior links and isolates. As expected, Alon Johnson as Technology Director had many links within the technology department, and the department had two internally distinct but connected groups – "research" and "development." Alon had also at least a few links outside his department: to the lab, preproduction, and factories.

Denis wondered what employees would make of the marketing department – they appeared to have no agreed ties with anyone.

Network Chart 3: New Product Development - IS

Both sides: "IS New product development" at least important
Grouped and coloured by "Department".
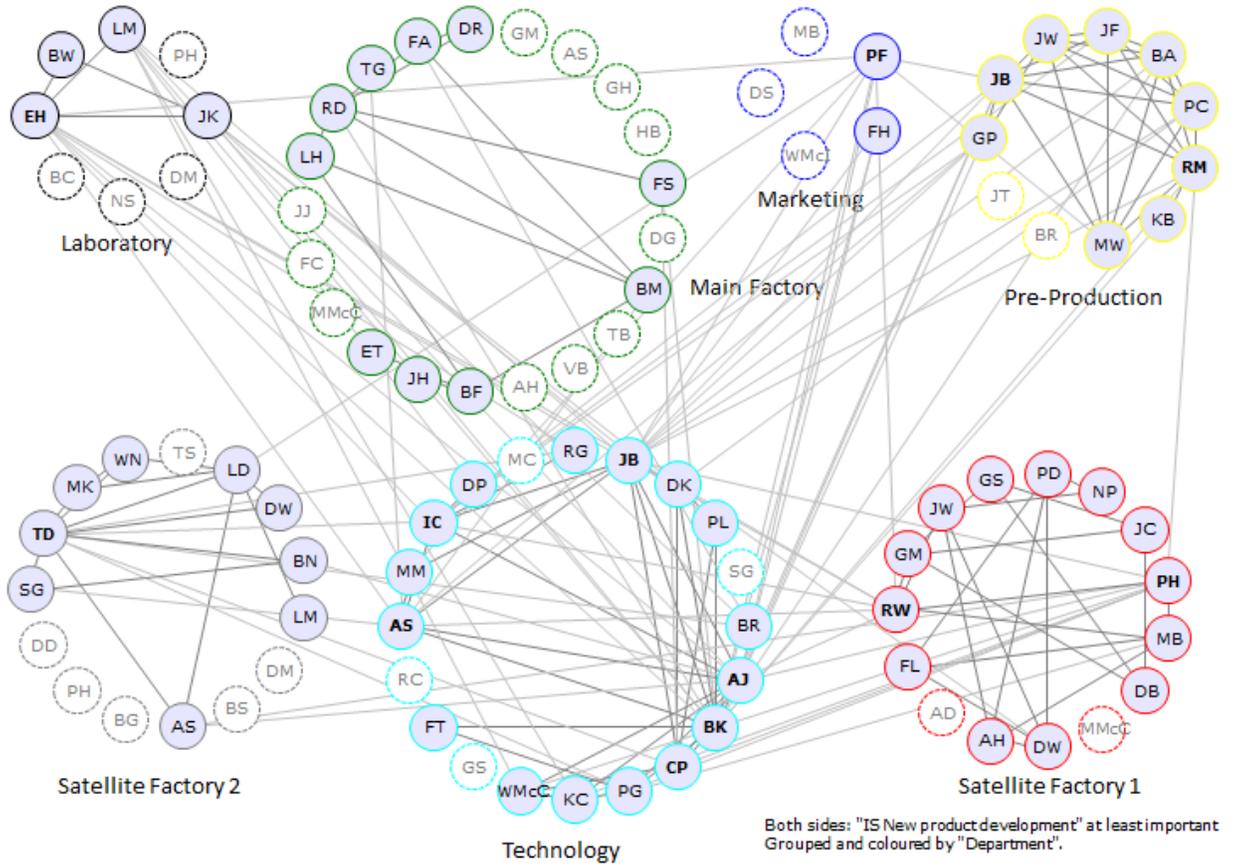
Magus Toolbox had made sure to ask questions around new product development. The chart above showed where employees agreed that, of the people they talked to about new product development, this link was at least somewhat important. It appeared, from the number of links, that generating new products was clearly an important part of many employees' personal networks.

## Network Chart 4: New Product Development – SHOULD BE
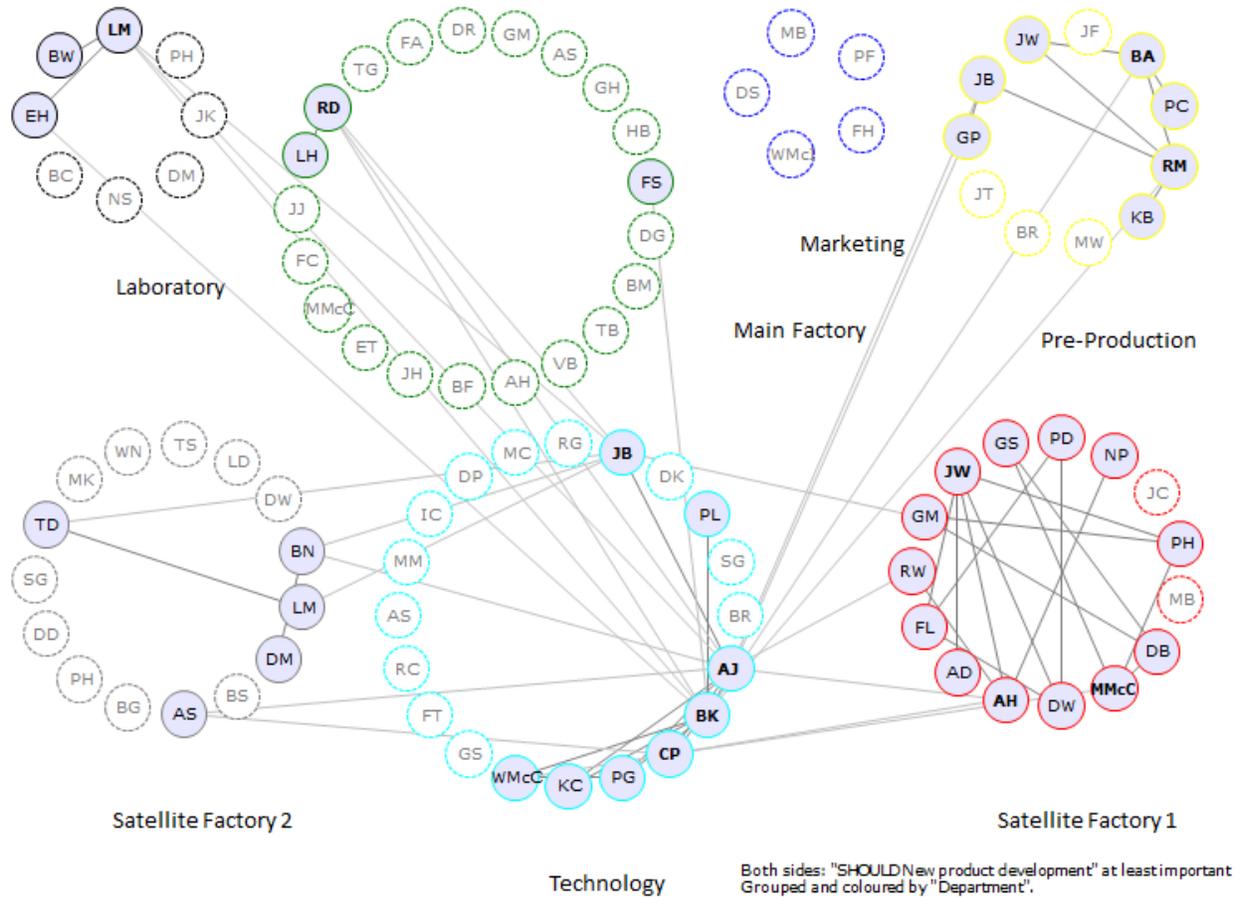
The chart above showed which employees identified that they were currently not working with others about new product development, but felt they should be, and where the other party agreed. In general there were not a large number of "should-be" links, although there were enough that Denis felt it might spur commentary during the workshop.

Network Chart 5: Compliance with Protocols - IS

Both sides: "IS Compliance with protocols" at least important
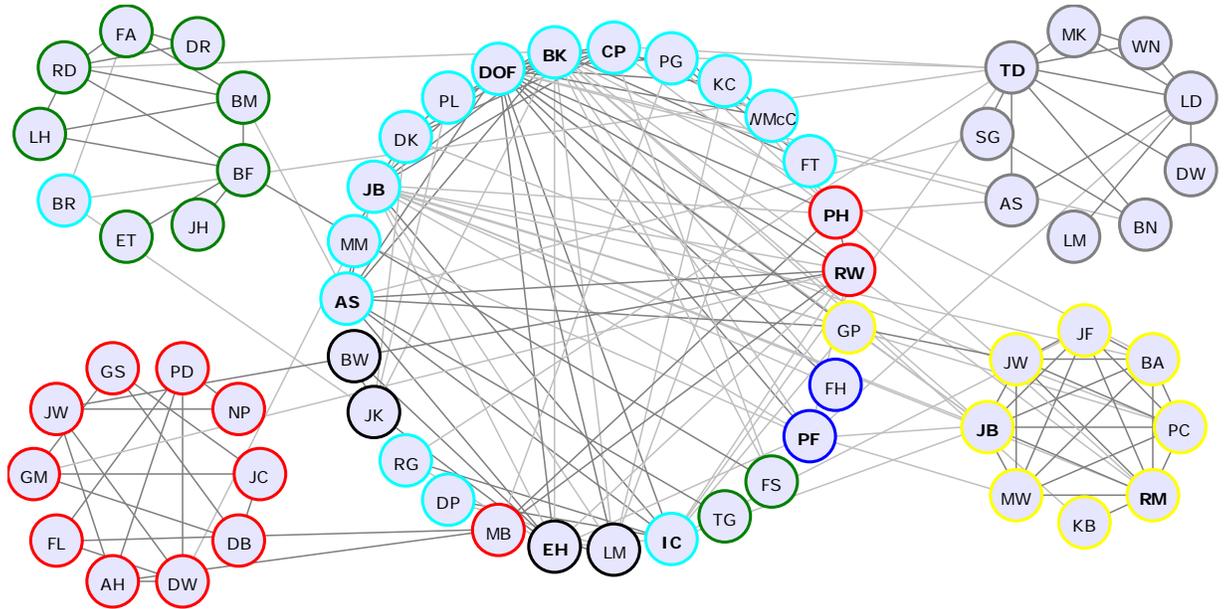Grouped and coloured by "Department".
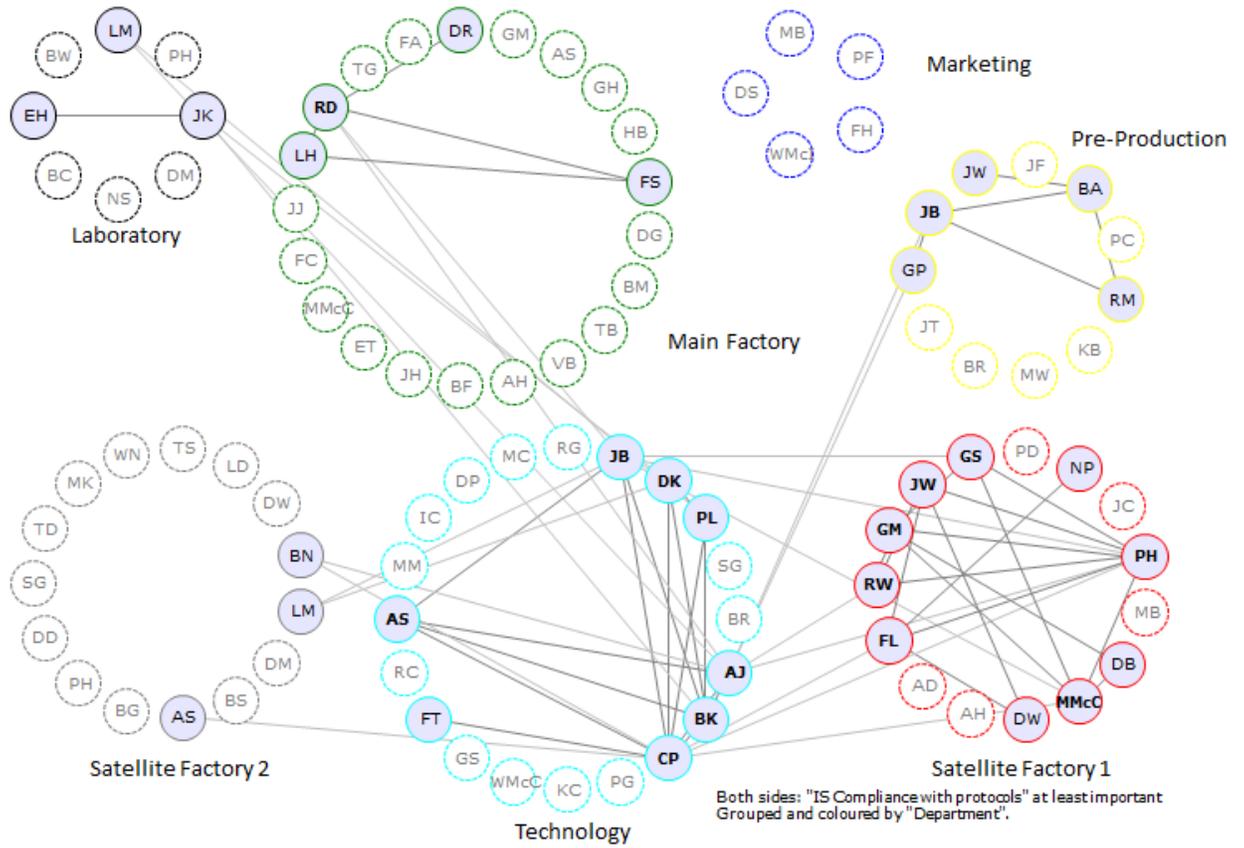
ProdCo required employees to perform frequent process checks to ensure that quality standards, worker safety and product liability risks were well-controlled. However, when asked to identify which of their links were at least "important" in carrying out these duties – as shown in this chart above – most employees struggled to identify more than a few. The links illustrated are where both parties agree on the existence and importance of the link.

Network Chart 6: Compliance with Protocols – SHOULD NOT
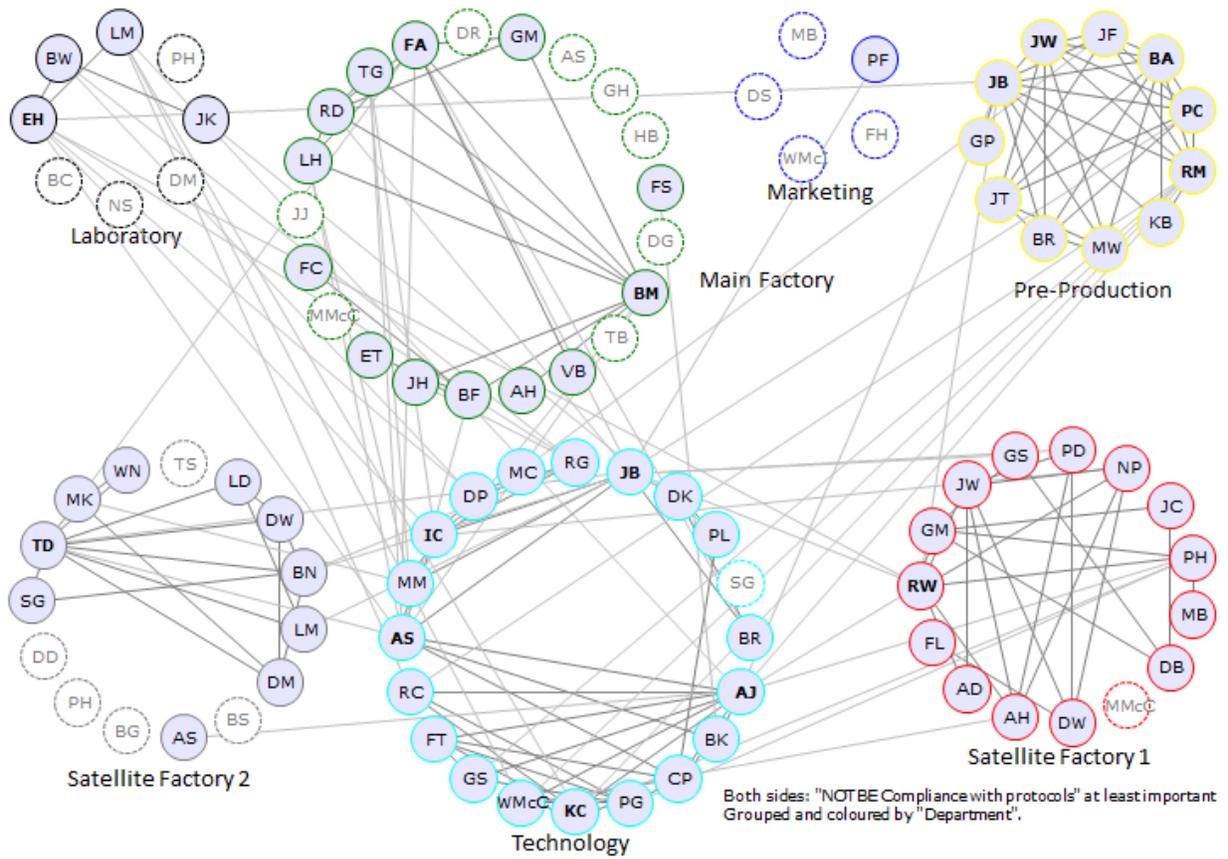
Additionally, when asked to indicate which people they should not talk to about compliance, many employees picked a large number of their counterparts. These links showed where employees were currently working on compliance issues, but believed they should not be.

Network Chart 7: Informal Network Structure View
New Product Development- IS

Both sides: "IS New product development" at least important
Grouped and coloured by "Department".

The chart illustrates social network theory, with participants reassigned between groups based on an algorithm that evaluates network ties. For example, the yellow group is highly integrated internally and well-connected with the big group. The yellow group has one member in the big group. The red group is similar internally to the yellow group, but much less well-connected with the big group. However, the red group has three members in the big group. The grey group is not well-connected internally, has few links with the big group and has no members in the big group. Few links exist between the smaller groups.

The driver was almost at the headquarters building. Denis was looking forward to seeing what lessons the discussions would produce for management.