

# **KECnetworking – Knowledge Management at Infineon Technologies AG**

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## **Abstract**

This case study describes how a manager and his team implemented and systematized the exchange of process-oriented knowledge within the factories of Infineon Technologies (manufacturers of silicon microchips), in five countries on three different continents, in order to solve manufacturing problems and to optimize procedures. The ambitious business goals of the company could only be realized if all ten sites were able to achieve the same level and quality of output. This would be possible, the manager felt, if valuable expertise were easily, continuously and freely accessible, as and when the problems arose, and not only sporadically, as had been the pattern in the past. To this end, they initiated the Knowledge Exchange Networking (KEC) project in 1990, in cooperation with the Knowledge Management Department of Siemens Central Technology Division. The KEC, as the project became known, is ideally suited to serve the ever-changing and highly competitive field of semiconductor technology, where strategic technological knowledge has a relatively short “half-life” and thus needs to be transferred and implemented as quickly as possible.

The case begins with a brief history of the development of the microchip, followed by an overview of the KEC project. Here, not only is the current structure of the knowledge exchange examined but some of the pitfalls encountered during the development of this initiative are reviewed, as well as the steps taken to make improvements.

*"The permanent, personal knowledge exchange among small expert teams with the same expertise, leads to stronger personal relationships and networks. In this way trust is built among the participants - a prerequisite for efficient best-practice sharing and for overcoming the "not invented here" syndrome. And finally: a driver is needed who will organize the continuous exchange of knowledge and who will watch over the ongoing exchange."*

*Dr. Helmut Gunther, Infineon Technologies AG, Senior Director Memory Products Frontend Productivity Improvement*

## **The corporate context**

### **Infineon Technologies AG - A new name with a long tradition in semiconductors**

On 1 April 1999, the Siemens semiconductor division was newly established as Infineon Technologies AG. A little less than a year later, on 13 March 2000 the company was publicly listed. During this process, the name Infineon became widely-known, and the initial stock offering was oversubscribed thirty times. With the exception of Deutsche Telekom, Infineon had become the second largest initial public offering (IPO) in Germany.

The company is no newcomer. It was founded on a long tradition that goes back to 1952, when the first factory, called Siemens Halbleiter (HaF) - Siemens semiconductors - was established. During the last five years, the firm ranked 10<sup>th</sup> overall position in the ratings of the world's largest electronic microchip producers. As a multinational company, Infineon has become a globally intertwined network of development and production sites and one of the most aggressively expanding companies in the industry. The company had revenues of around four billion Euros in the 1998/99 business year and has more than 25,000 employees, of whom fifty per cent are outside Germany. Infineon attracted particular attention with this year's IPO, but the firm's origins can be traced back much further.

### **1947-1957 – a decade of transistors**

In 1947, the invention of the transistor presented an alternative to the vacuum tube. At that time, the newly emerging semiconductor industry was already characterized by the same attribute that is still its hallmark today: the belief that progress lies in miniaturization. The transistor, which was much smaller than the vacuum tube, produced less heat and consumed less energy, meant that products could be built much more compactly than ever before. The transistor radio was born.

Barely five years later, Siemens founded the Siemens Halbleiterfabrik (HaF) or semiconductor factory. The following year, the first germanium transistors went into production. The firm's headquarters is still situated in Munich where it moved in 1953.

### **A new semiconductor leads to rapid progress**

In 1957, production of a new kind of component commenced, using silicon, a non-metallic element that possesses most important semi-conducting properties. Six years later, in 1963, Siemens started production of integrated circuits, which had replaced transistors and are crucial in the construction of computers. At the time, Siemens was continually expanding, and had established several production factories in Germany and Singapore. Today, Infineon controls ten state-of-the-art production sites in five countries, including memory chip factories on three continents: Europe, Asia, and the USA.

## **A volatile and extremely competitive market**

The semiconductor market has been marked by rapid growth, propelled mainly by the proliferation of the personal computer. During 1992-1999, the global market grew at an average rate of 10.2%, with total revenues increasing from \$US50 billion to \$US55 billion. During the same period, Siemens/Infineon's growth was twice that. The strong market was offset by equally strong volatility with the industry fluctuating between -20% to +50% during the last ten years.

Siemens was not spared these market fluctuations or the enormous competitive pressures. The global excess capacities of 1997/98 led to a decrease in the price of memory chips. This forced Siemens/Infineon to close a production site in the UK. The newly established factory in Dresden, which the media had previously hailed as the "Silicon Valley of eastern Germany", also came under intense pressure to perform. On the whole, this market is, arguably, a future one. Electronic intelligence will become an integral part of our lives. The industry has coined the term "ubiquitous computing" and examples of what is envisioned are "interactive cars" and the concept of "intelligent houses". Technological progress is, and has been, based on miniaturization, compactness, economy and improvement in memory chip performance. Whereas the first cellular phones weighed roughly 500 grams, the newest models weigh less than 100 grams and they are significantly cheaper.

The semiconductor industry presently differentiates between three types of chips, namely micro processors, logic chips and memory chips, all of which are produced by Infineon. While micro processors and logic chips are minute computing machines, memory chips, (also called DRAMs) provide the information that is necessary for computing.

Rapid technological development and the race to be first to bring a new technology to the market are especially fierce with DRAMs. Development has occurred in leaps and bounds, often cooperatively. In 1981, the 16 kbit DRAM was produced; in 1985, cooperation with Toshiba resulted in the 1Mbit DRAM and in 1990, cooperation with IBM led to the production of the 64 Mbit DRAM. From 1992 on, cooperation has resulted in steady progress, the most recent development being the 256 Mbit DRAM, in cooperation with IBM and Toshiba.

This short history illustrates two important points about the nature of this industry. Firstly, it highlights the increasing pace of development and the rapid decrease in the "half-life" of knowledge. Secondly, it emphasizes the importance of cooperation and joint ventures with competing firms, as with IBM and Toshiba.

## **Partners in development**

Despite the intense competitive forces and pressure to bring new products to the market, Siemens recognized the importance of cooperation and strategic alliances at an early stage. Siemens/Infineon not only cooperates in the area of technology development with IBM, Toshiba, and Motorola, but also counts NEC, Nokia, and SONY among its strategic partners in application development.

The company's primary motivations for cooperation and network formation are:

- The sharing of risk and development costs
- The reduction in product "time-to-market"

This takes on special significance in light of the growing complexity of the circuitry production process of integrated circuits.

### **ICs and their production become more complex**

The basic raw material required for the manufacture of integrated circuits (ICs) is a silicon wafer. The wafers are manufactured from raw silicon, which occurs naturally as silica in sand and quartz. This silicon is then purified and cultivated in a single crystal form. These crystals are then machined and sliced into thin wafers. ICs are manufactured by depositing layers of various chemicals and gases on the wafer, etching away the unwanted areas, and then implanting various isotopes in certain areas to achieve the desired electrical parameters. In this way, thousands of transistors are manufactured on a few square millimeters of silicon. These transistors are then interconnected to form logic gates (switches), which are the backbone of any digital circuit. The minimum dimensions to which these ICs are manufactured are as low as  $0,18\ \mu\text{m}$  (i.e. one millionth of a meter), or one thousand times thinner than a human hair. ICs have already been manufactured on an experimental basis to a minimum geometry of  $0,13\mu\text{m}$ .

Given the extremely small dimensions of ICs, the manufacturing process must take place in an extremely clean environment as any dust or other particles will contaminate the IC. Such clean-room factories, cost several billion US dollars to set up.

The chips are produced on so-called wafers, a silicon slice on which, depending on the size, two thousand or more chips can be placed. As long as the chips are still on the wafer one speaks of "Frontend" production; as soon as the wafer is cut into individual chips, the so-called "Backend" production begins. During this stage, the chips are wired and the necessary connections applied. After packaging, the chips are then ready to be inserted into circuit boards.

The manufacturing and assembly process can involve up to five hundred steps. To achieve a cost-effective end product, it is critical that the design of the IC, as well as the manufacturing process, is optimized, in order to reach the highest possible yield of functional ICs from each wafer.

In Dresden in 1999, Infineon became the world's first company to harvest 45% more functional chips from a 300 millimeter wafer than is currently possible from a traditional 200 millimeter wafer - a significant competitive cost advantage for Infineon.

The initial public offering in March 2000 was another important step in the company's history. This made the name "Infineon Technologies AG" very well-

known indeed. "Infineon" is a hybrid of the English term "infinity" and the classical Greek word "aön", which means life or eternity. This amalgam signifies endurance, dependability, flexibility, agility and innovation. It reflects the corporate philosophy: "Never stop thinking". Infineon's motto is to always be one step ahead and the strategic goal of the company is to produce the most innovative products in the most cost efficient way. For example, Infineon was the first to produce a biometrical sensory chip in series. The status afforded by intellectual property (IP) is one of Infineon's primary motivation to invest in R & D of IC technology. (The company presently has almost 24,000 registered patents.)

### **Restructuring for the 21<sup>st</sup> Century**

The public share offer also brought extensive demands for restructuring. Flatter hierarchies and more flexible units were needed to react efficiently to the extreme fluctuations in the highly dynamic market. An organizational structure that could meet the demands of both the customer and market was implemented. Today, the organization is structured into five key business units or market-oriented divisions. These are Communications & Peripherals, Wireless Products, Automotive & Industrial, Security & Chip Card ICs and Memory Products. Each of these divisions is subdivided into the following components: Front End, Back End and Sales/Marketing.

Going public offered Infineon new opportunities to expand the firm and enter into new strategic partnerships. This has led to increased market potential, since Infineon may now serve competitors of other Siemens divisions as they do any other customer, for example, Infineon may sell its micro chips to Nokia, a competitor of Siemens ICM in the mobile phone market

### **The importance of Knowledge Management**

The above brief description of the current state of affairs at Infineon will help the reader appreciate the increasingly important role Knowledge Management (KM) plays at Infineon. Factors both inside and outside the company are reviewed below:

1. *Global competitive forces are increasing performance pressure for Infineon:* The further development of semiconductor technology is extremely dynamic and competitive pressures are strong. The key factors for maintaining a competitive advantage are performance, productivity and innovations. Infineon has recognized a crucial factor in this is the knowledge of the organization, especially of the employees.
2. *Strategically important knowledge is distributed worldwide:* The various production sites differed significantly in their levels of performance. Gunther believed that by making the transfer of knowledge gained from experience to other sites, an equally high level of production across all sites could be achieved. Worldwide networks of experts are crucial to the transfer of available, strategically important knowledge.

3. *The production process for chips is highly complex and very knowledge-intensive:* The production process for chips requires highly specific technological know-how acquired by years of experience. The development of new technologies occurs increasingly rapidly, leading to a relatively short "half life of knowledge".
4. *Existing technology is not necessarily a source of lasting competitive advantage:* It is practically impossible to prevent the competition from quickly imitating, or even improving on new products or methods. Since one core technology is available to virtually anyone, this is factor alone cannot ensure a lasting competitive advantage. This has led to the emergence of a global market for ideas where concepts and formulas are freely available to almost anybody.
5. *How much should one share with one's competitors?:* Strategic alliances and joint ventures have become necessary in order to minimize risks and maximize time and cost advantages. The value of knowledge to Infineon is clearly evident in the form of many patents for new products and production procedures. (These can also be subjected to monetary valuation.) However, questions regarding what knowledge should be shared and what should not, are a central issue in the KM concept.

## **Knowledge Management at work**

### **Facing a challenge**

Infineon's Memory Products division produces mainly memory chips at its production sites across the world. These are found not only in computers, cellular phones, and digital TVs, but also in jets, pacemakers, and ATMs.

Today Helmut Gunther's division is responsible for the improvement of productivity indices of the globally active sites (also called Fabs) of the Frontend. In the early 1990s, Helmut Gunther - as responsible manager for transferring processes and for the manufacturing support of both problem-solving procedures and optimizing procedures - had the idea to foster the exchange of process knowledge and to systemize the knowledge. Instead of the current just-in-time and problem-oriented knowledge transfer, he wanted to establish a permanent know-how exchange among the factories, so that they could achieve business goals together.

Gunther was aware of the fact that a crucial prerequisite for the improvement of overall productivity and knowledge sharing would have to be the interconnection of experts. This prompted him to initiate the project KECnetworking (Knowledge Exchange Networking). The project was executed in cooperation with the unit Information and Communication at the Central Technology Division of Siemens AG (ZT IK 1).

In conversations with site representatives, his initial impression that a continuous knowledge exchange promised much potential, was repeatedly confirmed. The diverging productivity figures of the different factories, often producing the same chips, confirmed this as well. Furthermore, the process steps for all chip production are very similar and are executed by the same type of machines. This meant that both similar mistakes and development efforts were being duplicated at the various sites. Considering that a single day of missed production or one missed process step on one machine can cost several million US dollars, the potential for improvement was self-evident.

In the course of conversations with employees, Helmut and his team also gained the impression that the existing databases, which were only constructed for the exchange of documents, were not a sufficient base for continuous knowledge exchange. Helmut set about motivating the responsible management of the individual sites to take action to improve the situation.

## **Providing a solution**

### *Initial phase*

At the outset Helmut and the site representatives analyzed the situation.

At fourteen different sites, over one thousand experts worked in twelve single-process technology areas. Although these sites did not all produce the same types of chips, there are similarities between the different generations of chips. Experts within the single-process technologies were faced with very similar problems and challenges, so it was therefore possible that a site producing a new chip generation could learn from one that had been producing ones of an earlier generation.

Some interactions had been institutionalized, such as process-transfer projects that have a limited duration and various regular management committees meetings. The experts themselves could only exchange experiences and provide support on the basis of individual, personal contacts.

Explicit knowledge was documented and exchanged by capturing some of the contents on databases. In most cases, the complexity, size, and perishable nature of the explicit knowledge made this type of documentation process too laborious and not practical enough.

Siemens' rapid growth, its cooperation with other firms, its restructuring, aggressive hiring policy and establishment of new sites had made it increasingly complicated and difficult to develop and maintain such personal networks. In addition, a few cases of repeated mistakes and redundancies happened that could have been avoided by an improvement in the exchange of experience.

## **Utilizing Communities of Practice**

At the end of 1996, Gunther and the site representatives decided that they try to improve the situation by interlinking experts in topic-specific Communities of

Practice (CoP). This notion emanated out of the work at Xerox Parc at the turn of the decade, where the copier engineers were observed to share their know-how around the water cooler. It has now become an accepted term in the context of knowledge management. Essentially, a CoP is a group of people who are peers by virtue of the kind of work they are engaged in. It is not a formal team but an informal network, which shares a common agenda and interests.\* At Infineon, a community of practice (CoP) is understood to be a group of like-minded people, prompted by a mutual interest in a business-relevant area of activity, to share and develop knowledge across organizational boundaries to offer mutual support. Through cooperation, not limited by time constraints, the community has both a virtual and face-to-face character.

The aim was to accelerate the achievement of business goals by promoting the exchange of available knowledge and the development of new knowledge (by improving the networking between experts). This project was named KECnetworking (Know-how Exchange Networking). The following objectives were formulated:

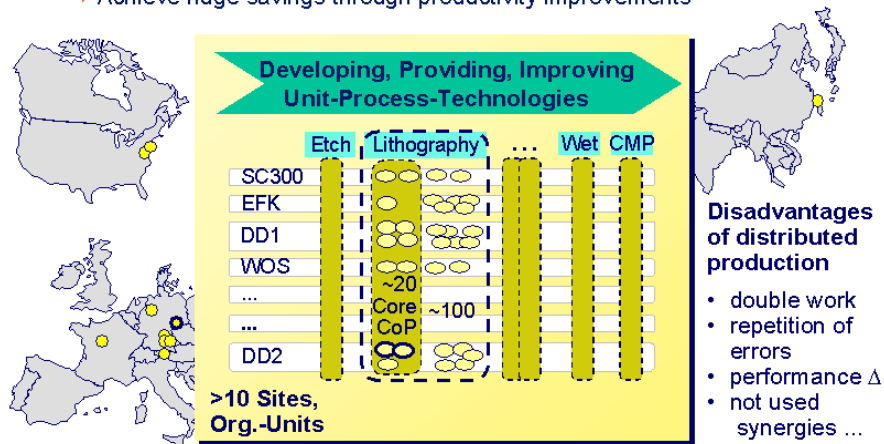
- Increasing productivity and optimizing production processes.
- Ensuring that process transfers between sites are managed with speed and efficiency to facilitate sharper learning curves.
- Swifter integration of new employees into CoPs.
- Reducing the duplication of mistakes at the various sites.
- Reducing redundancies at different locations.
- Better coordination of the process, technology, and facility roadmaps.
- Faster delivery of new, innovative process technologies.
- Improved cooperation with suppliers of facilities and materials.

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\*<http://www.skyrme.com/updates/u15.htm>

### Business Challenges

- ▶ Provide competitive and innovative production processes
- ▶ Achieve huge savings through productivity improvements



### An important solution element for reaching the goals:

- ▶ Networking of worldwide distributed experts in their competence fields in „Communities of Practice“ (CoP)

### Figure 1: Challenge and CoP solution for KECnetworking

The first step was the categorizing of the entire Frontend production process into twelve clearly distinguishable topic areas (single-process technologies). For every topic area one moderator from the division Memory Products Frontend Productivity Improvement was chosen, as well as at least one topic representative for each site. Each of these communities organized an experience-exchange meeting, led by the moderator. These meetings lasted from one and a half up to three days, and up to 35 experts from almost every site around the globe participated.

After these meetings, Helmut and his team gathered feedback on their experience with the Communities-of-Practice approach. The initiative was unanimously approved. The participants had been pleased to have the opportunity to establish good contacts and personal relations with other production sites. There was, nevertheless, equally strong agreement that much could be done to improve on the first KECnetworking activities. Participants complained, for example, that the borders between topic areas were not clear enough, that the focus of the topic areas was too wide, or that the quality of the exchange was not up to standard.

To address these problems systematically, Gunther and the team of representatives decided to analyze their findings. To this end, he assembled a team composed of KEC-community moderators and Siemens internal consultants. Their brief goal was to identify potential areas of improvement, as well as to seek out and implement appropriate intervention measures.

### *Analyzing phase*

In the second phase, the consulting team analyzed the framework and activities of the KEC communities and the integration of these activities with day-to-day work procedures. Additionally, similar corporate activities and their influences were discussed.

To begin with, interviews were conducted with many of the participants and documentation material and information systems were analyzed. Participation in KEC meetings allowed the consulting team to uncover existing barriers and areas that showed potential for improvement. The results of the first phase of analysis were subjected to a survey of 150 active KEC members, so as to acquire the opinion of and ideas from as wide a range of involved people as possible. The following points were addressed in the survey:

- The individual's perspective on the potential cost-benefit ratio of the KEC activities (compared to the existing ratio).
- The extent to which the individual's need for varying KEC outputs had been fulfilled.
- The individual's opinion on the importance of single-success factors for effective and efficient KEC activities and their degree of fulfillment.
- The type and extent of communication on KEC outputs with site colleagues who had not been directly involved in the meetings.
- The individual's opinion on KEC activities being able to meet expectations and suggestions for improvement.

The analysis phase clearly showed that KM improvement measures were well received by all participants. Core results also showed that there was a definite demand for an efficient and continuous knowledge exchange and collaborative knowledge development. At the same time, the following deficits and barriers were revealed:

- Knowledge exchange by way of semi-annual meetings was not continuous enough. These meetings were largely dominated by discussions of the most recent experiences, while important ones, no longer of immediate concern, were often neglected.
- The meetings lacked goal-orientation and so were not very efficient.
- The interest profile of the members was too heterogeneous, as was that of the KEC community generally.
- The slides presented did not include key lessons. These had been communicated orally only.
- Language difficulties, as well as the use of jargon not known to everybody, got in the way of the exchange of knowledge.
- Between meetings KEC communities used e-mail as the only form of communication. The existing databases were only used for special projects. A common, specific information platform for each community was missing.
- The distribution of findings from the meetings to other interested parties, who had not participated, was insufficient.

- Experts and other knowledgeable persons were also people who operate under severe time constraints and this meant they could not always adequately participate in the exchange of experiences.
- The participants did not have enough time for support activities, such as the structuring, editing, and maintenance of stored information, in addition to attending community meetings.
- The fear of losing knowledge to joint-venture partners or competitors, through closely integrated suppliers, complicated the experience exchange.

The results of the survey concluded the analysis phase and were discussed with KEC moderators and members, as well as the consulting team, at a final workshop in March 1998. In just more than a year much had been achieved.

However, if the CoPs were to support Infineon in achieving its future goals, further improvement was needed. A concept needed to be developed and implemented that would improve these procedures in the KEC communities.

### ***Improvement phase***

Following the workshops, measures for improvement were defined and concretized, and an action plan was agreed upon.

This included:

- The formation of a KEC support team to aid KEC activities and minimize friction.
- The integration of KECnetworking with the business environment to ensure optimal preconditions for knowledge exchange.
- Improvement of the general organization and modification of individual KEC communities regarding their group composition, the formation of special subgroups, and the coaching by KEC moderators.
- Improvement of the preparation and execution, and a review of regular "face-to-face" meetings and telephone conferences.
- Better structuring of the content of the topic areas and the design of transparent processes regarding experts and sources of information.
- Setting up an information platform, as well as a process for the long-term entry, maintenance, and use thereof.
- Providing appropriate information and communication tools and work methods to facilitate teamwork for groups who are geographically dispersed.
- Internal and external promotional activities to heighten the awareness and acceptance of KECnetworking, as well as recruiting new members.

The consulting team, in close cooperation with KEC moderators and other key individuals, piloted these measures in individual KECnetworking communities before transferring them to others.

These stages (initial, analyzing, implementing improvements) describe the progress of the *implementation* of KEC. The following section takes a closer look at each individual *component* of the KEC, its functions and how it is constituted. These are:

- *The Communities of Practice – activities and roles, their composition*
- *Netmeeting – an online collaboration tool*
- *An information platform – what it is and how it is structured, the nature of the knowledge shared*
- *Current activities*

## Components of the KEC

### 1. CoPs - Activities and roles

To promote transparency regarding processes and roles in the KEC communities and to provide specific support for these, a community model was developed. This model outlined the practical activities of the community:

- Regular meetings for exchange and for alignment of projects and fab activities.
- Promoting transparency in knowledge areas; providing access to experts.
- Identification, acquisition, and integration of external knowledge.
- Learning from experiences and documentation of explicit knowledge.
- Continuous information exchange and discussions.
- Internal/external benchmarking to locate areas of potential.
- Just-in-time problem solving and mutual support.
- Collaboration and experiments in expert teams.
- Competency development and training.
- Developing new business opportunities.

The roles identified for these were in essence:

- **A CoP initiator.** The initiator provides the first decisive impulse for the creation and formation of a CoP. He or she suggests the idea, develops the concept and gives the CoP its initial momentum. He or she can be one of the group's members, but can also be a member of management or one of the persons responsible for KM.
- **A CoP sponsor.** The sponsor is generally not a member of the group. This optional role, basically to provide financial and strategic support, can have a strong and positive influence on the success of a CoP.
- **A CoP moderator/manager.** The moderator or manager of the CoP organizes, moderates, and governs the entire group. He or she is the primary contact person and the motivator of knowledge exchange and development (support activities). In large groups, subgroups with their own moderator are often formed. Assistants often help the moderator when he or she provides support activities.
- **CoP members.** The active members of the CoP participate in and contribute to the activities of the CoP. A CoP may have passive members who, for example, are just listed on the distribution list and occasionally use information from the CoP in their work.
- **CoP support.** In companies in which CoPs represent a strategic KM instrument, individual CoPs often depend on organizational units for support and

coordination. This role encompasses easing the burden of operative and supporting

- activities for members and moderators. The assignments vary from event organization, reediting and researching of contents, to the provision and administration of the IT infrastructure, and the general coaching of the CoP.
- **CoP external knowledge carriers.** The CoP external knowledge carriers with whom contact is made and relationships exist, are very important. They can be internal corporate employees as well as external persons working with partners, suppliers, customers, and – under specific circumstances – even competitors.

### **The Composition of a CoP**

An average KEC community is more than three years old and comprises 10 to 35 active, and over 100 passive members. To deal with specific subtopics, temporary expert teams are often formed. This approach allows answers to special questions to be found quickly and, enhances the knowledge exchange that occurs between the semiannual meetings of the entire group.

The layering of group sizes - ranging from small expert teams of about five persons to the entire group of more than 100 passive members - has proved to work well for KECnetworking.

While the expert teams develop solutions to specific topics, the active members communicate informally, but regularly, on matters pertaining to the community and benefit particularly from the experts and the transparency of activities. The passive members generally do not contribute anything to the community, but wish to be informed about general developments within the community and are able to communicate informally, if the need arises.

### **Netmeeting –online collaboration**

To support the online collaboration of KEC communities, experts were provided with the tool MS Netmeeting. Netmeeting is an application that allows users to view and work with the same screen contents on the Infineon-wide Intranet. The use of desktop video cameras, microphones, and speakers significantly improves dispersed teamwork. KECnetworking members are specifically schooled in the use of Netmeeting and provided with a range of aids for the use and monitoring of these sessions.

### **Information platform and topic structuring**

In the beginning KEC communities did not have access to an adequate information platform which could provide every KEC community with information that is relevant or important for individual process technologies. In KECnetworking this is done by the means of a LotusNotes database.

The contents of this database are structured in the following way:

- People. Yellow pages of community members and external knowledge carriers.

- Teams. Overview of the subgroups, including their topic focuses and members.
- Events. Event calendar with additional information regarding future and past events.
- Activities. Information about intra- and inter-site projects, evaluations, and process modifications, etc.
- Information base. Additional databases, web links, patents, glossaries, etc.
- Discussion. Opportunity for discussion regarding various topics of the CoP.

Any member can use this information platform to enter or modify information. In the figure below, a screenshot of the KECnetworking's "knowledge-spider" is shown. The multidimensional-content structure facilitates the systematic categorizing of documents and competencies. This mask can also be used to search for information.

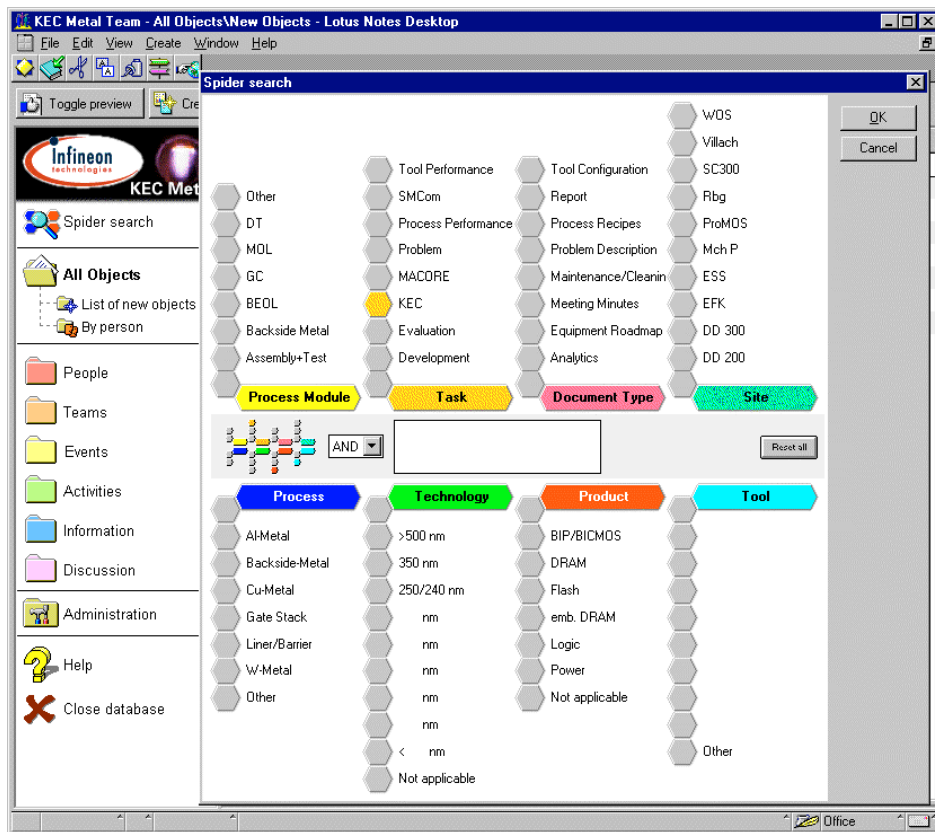


Figure 2: "Knowledge-Spider" as a categorizing and search interface

## **Defining knowledge areas**

The knowledge focused in the community is always a critical factor in Infineon's value chain, as it is not openly available on the global knowledge market. Due to the fast-paced and dynamic nature of technological development and the associated decrease in knowledge half-life, a constant need for new knowledge arises. Even if much explicit knowledge can be documented, implicit knowledge is particularly important in the creative and innovative processes taking place.

It is important to recognize that in this process individual participants are dealing with highly specific topics. The number of participants interested in detailed information or knowledge about any single topic will be relatively small. For this reason, topics are defined so as to be relevant to all participants, in almost all aspects of their daily job, thus promoting more active participation.

## **Current activities**

Compared to those of the starting phase, current activities are much more intense and multi-layered. The semi-annual meetings that took place in the beginning, have been enhanced by collaboration in diverse expert teams, regular phone calls, information exchange on the community platforms, and strengthened mutual support.

Now the experts have semiannual to quarterly face-to-face meetings for one central, compulsory module in KECnetworking. These meetings enjoy such high priority among the experts that most of them attend every one, despite their heavy schedules.

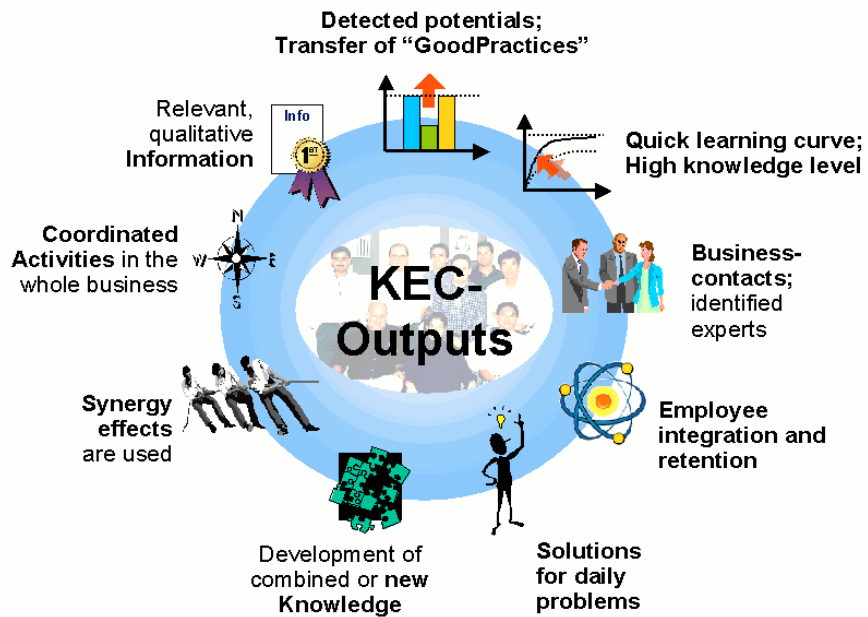
During these meetings the flow of detailed information is relatively limited, the focus being on creating transparency in areas of knowledge, identifying mutual interests, as well as building and maintaining personal relations for successful cooperation between themselves. More detailed and concrete exchanges usually take place bilaterally or in small groups after or between meetings in the long breaks provided. A face-to-face meeting of one and a half to three days has proven adequate.

The participants have explicitly stated that the cooperation between different production sites has significantly improved and they see this as largely the result of the personal contacts forged during the KEC meetings.

The degree of activity in the CoP is subject to strong fluctuations during the annual cycle. This rhythm is determined by the semiannual to quarterly face-to-face meetings as well as by other special KECnetworking activities. At these times, the use of the information platform increases sharply immediately before and after meetings. The relevant employees also invest roughly two full working days in preparation for the meetings. The "continuous activities between regular meetings" that were requested by the participants themselves, have also increased. However, the discussion forum on the information platform remains largely under-utilized for this purpose, with participants preferring spontaneous mutual support or mid-range cooperation in small expert teams.

## Outputs:

Key outputs of the KEC communities can be summarized as follows:



**Figure 3: Starting point and CoP solution at KECnetworking**

- Discovering improvement and innovation potential as well as the transferring and recycling of good practices, insights, and lessons learned.
- Transparency and access to topically relevant and high-quality information from a central source.
- Aligned activities throughout the firm, for example common definitions for technology, facility, and process roadmaps.
- The functional role of the communities as the technical interface to facility manufacturers.
- Development of combined or new knowledge.
- Communal experiments, such as the evaluation of facilities, processes, and new technologies.
- Gaining answers and helpful hints to solve every day problems.
- Integration with the network promotes employee loyalty to the firm.
- Identification of contact persons and improvement of relations network.
- A sharper individual learning curve and generally a higher level of knowledge.

This list of outputs shows how abundant the benefits are that can be derived from KEC communities.

## Promotion

Within Infineon, KECnetworking is an innovative and visionary initiative and is therefore of crucial importance. Indicative of this fact is, for example, the fact that KECnetworking is considered one of the firm's 12 globally strategic projects with which Infineon hopes to win the European Foundation for Quality Management's Quality Award 2000. As an example of applied KM at Infineon it is also promoted in internal and external publications, not only providing the company with positive public relations, but also strongly motivating KEC members. The name KEC is known far beyond its business boundaries— so much so that an attempt at renaming the project had to be abandoned.

## Benefits and success stories

Measuring the performance of KECnetworking activities in an exact manner (for example, calculating Return on Investment) is difficult. So far the creation of a "financially accounted for internal knowledge market", which is a theoretical option, has not been attempted. Costs can be traced relatively precisely, but benefits are difficult to assess accurately, mainly because they are not easily measurable, and are difficult to quantify monetarily. Many diverse factors make the true influence of KECnetworking difficult to ascertain. To overcome this, an attempt is being made to collect success stories that are directly linked to KECnetworking activities. An example follows in the box below.

### ***A successful good-practice transfer***

*Fab A was in need of significantly stronger production capabilities. A new production facility of several million US dollars was considered*

*The moderator of the KEC community took on the role of broker and introduced Fab A's experts to those of Fab B, instead of waiting for them to find one another directly, as is usually the case.*

*A detailed comparison with Fab B showed that one process improvement had just achieved a 1.4% productivity improvement at a certain facility. Within two weeks, the process technologists from both sides had transferred the process innovation from Fab A to Fab B. This was no simple task given the different process environments.*

*The experts confirmed that, in this case, the common context provided by KECnetworking significantly aided the fast and successful process transfer. A substantial investment in a new facility was no longer required and benefits to the company ran into millions of US dollars.*

Even if the Return on Investment of the activities cannot be delivered at this point in time, the solid motivation of all participants gives rise to the expectation that KECnetworking will contribute positively to business in the future.

The individual participants strongly support these activities and are of the opinion that the benefits resulting from KECnetworking largely outweigh the effort.

## Conclusion

Helmut's experiences of the past and how he sees the future can be summarized as follows:

The initial success of the project has encouraged him and his team to keep on expanding KECnetworking. The continuous exchange of personal knowledge holds considerable promise for a business that flourishes through the linking of experts with common expertise and interests. Strong personal relationships, based on mutual trust and frequent, direct communication, are necessary preconditions. This enables experts and community members to let others benefit from their experiences, while discovering and copying good ideas from one another. A common motivation and driving force are essential for the ongoing exchange of knowledge.

## Key Propositions

All participants gained much experience with the Communities of Practice approach during the course of the KECnetworking project.

The following is an overview of key lessons learned:

**1. *The information platform must be centrally available and well-structured.***

The central availability and well-structured nature of the most important information regarding the topic areas is seen as a great benefit. This is mostly the task of the project leaders or the KEC moderators

The Knowledge Spider's uniform categorization of the platform contents has significantly contributed to the acceptance thereof, by providing a good overview of topics and helping to control the complexity of the topic.

**2. *Moderators play a vital role***

A well-skilled moderator has proved to be one of the determining factors in the success of a CoP, as his or her action significantly influences the use of the information platform, the contributions and the communication between the members. In addition, the effectiveness of the meetings strongly depends on him or her. Moderators are known experts who have enough experience to exert a positive effect on CoP members, while additionally being involved in the daily activities of other experts.

**3. *Funding fuels the CoP***

It is important that the activity of the moderators and the information and communication platform are properly funded. Without that, the effective organisation and functioning of the CoP is endangered. With a generous sponsor it goes faster to launch and run a vital CoP.

**4. *Limits of communities – the need for additional support***

There are also limits to the activities of KECnetworking. Of special importance is the balancing of informal and formal organization of communities. For example, when problems arise, experts of different sites often help one another. To support these activities, the central sponsor – whose business objectives are set across sites – sometimes reimburses the travel expenses. Good use could be made of a CoP assistant to further support KECnetworking activities.

**5. *Additional incentives are not required***

No special incentive systems were introduced for KECnetworking activities to ensure that the activities are not undertaken as an alibi exercise. The primary incentives lie in reaching the individual participants' business objectives. Simply participating in the regular KEC meetings represents an indirect incentive as employees have the opportunity to make their own contacts and update their knowledge.

**6. *Consistent internal promotion is necessary***

The activities and results of KECnetworking were made known in various in-house magazines, management committees and on the Intranet as examples of particularly valuable KM. This consistent internal promotion has strengthened the confidence of the KEC communities by reassuring the participants that through KECnetworking they are contributing to the overall corporate success.

**7. *Keep the definition of CoP activities flexible***

The practical implementation and support of the KEC communities have repeatedly shown that it is not sensible to define CoP activities as detailed, stiff processes. The participants want to link-up in a flexible way and not be forced into procedures. However, they are open to comments and gladly accept help in order to provide a positive environment. This is additionally supported by the fact that Infineon employees increasingly communicate informally across hierarchical levels.

**9. *The need to foster and maintain strong personal relationships***

Strong personal relationships based on mutual trust are necessary preconditions. These relationships not only enable experts and community members to support others through their experiences, but they also discover and copy good ideas from one another. A common motivation and mainspring and a common goal to be responsible for and encourage an ongoing knowledge exchange is essential.

**Discussion questions**

1. Which typical characteristics of a Communities of Practice (CoP) can you deduce from this case?
2. In your view, what are the central factors that make CoPs a success in the Infineon case as presented here?
3. From today's perspective, what would you do differently in KECnetworking?
4. What types of content structuring do you know and how do they compare to the "spider model" of the Infineon solution?
5. What statements can you make regarding the following attributes of CoPs:
  - Lifecycle?
  - Size?
  - Structuring of CoPs?
  - Organizational connection/integration into a company?
6. How could integration into daily work be improved?
7. Describe the importance and the role of the moderator of a CoP.
8. Discuss the introduction of monetary incentives in CoPs in the case of Infineon Technologies AG.
9. Discuss the usage potentials, but also the limits of CoPs as a knowledge management instrument at Infineon Technologies AG.