Industry Case Study Series on IP-Management

Umdasch Group Ventures
Industry 4.0 in Concrete Engineering

By Alexander J. Wurzer, Werner H. Bittner & Johann Peneder

MIPLM Industry Case Study Series Nr.: ICSS2015-01-327
CEIPI, University Strasbourg in cooperation with
Steinbeis Transfer Institute for Intellectual Property Management
Steinbeis + Akademie, Thalkirchner Str. 2, 80337 Munich

Pegasus 2012
Hilde Umdasch

GERMAN INNOVATION AWARD '20 GOLD

Center for International Intellectual Property Studies | CEIPI University of Strasbourg

CEIPI MASTER OF IP LAW AND MANAGEMENT

AUTHORS

Prof. Dr. Alexander J. Wurzer

Dr. Wurzer is Adjunct Professor for IP Management at the Center for International Intellectual Property Studies (Centre d'Etudes Internationales de la Propriété Industrielle, CEIPI) at the University of Strasbourg, where he has been Director of Studies for the Master's degree in Intellectual Property Law and Management (MIPLM) since 2007. Prof. Dr. Wurzer is Director of the Steinbeis Transfer Institute for Intellectual Property Management at Steinbeis University Berlin. He is Managing Partner at WURZER & KOLLEGEN GmbH, a consulting firm specializing in strategic IP management.

Prof. Dr. Wurzer is Chairman of DIN committees DIN 77006 for quality in IP management and DIN 77100 for patent valuation. He is a member of the Board of Directors of "Deutsches Institut für Erfindungswesen e.V." (DIE), Spokesman of the Board of Trustees awarding the Diesel Medal, Fellow at the Alta Scuola Politecnica at Milan/Turin Polytechnic and Conference Chairman of IP Service World. He is also a jury member for the 2018 German Innovation Award of the German Design Council and a member of the group of experts of the European Commission.

Werner H. Bittner

Werner H. Bittner is CEO of Umdasch Group Ventures as of 1st May 2019. Prior to that he has served as Member of the Executive Board in this firm which went operational in January 2017. In May 2016, he had joined Umdasch Group in the newly established position of a Director Strategic Business Development at Doka which contributed to the set-up of Umdasch Group Ventures by Umdasch Group AG in November 2016. He had held various international management positions at Boehringer Ingelheim, Heidelberger Druckmaschinen AG and Collini Holding AG. With regards to his academic background, he has a Master's degree in Mechanical and Industrial Engineering from the Technical University in Vienna, Austria.

Johann Peneder

Johann Peneder is Member of the Executive Board of Umdasch Group Ventures as of 1st May 2019 and Managing Director in Umdasch Group NewCon GmbH and Neulandt GmbH executing the operational business. In October 2017 he had joined Umdasch Group Ventures as a Project Manager for Business Model Development and IP-Strategy. With more than 30 years of experience in the field of construction and formwork technology, he has held many international positions in the Doka division as a project manager and in technical sales. It was under his responsibility that the globally operating Expertise Center High Rise & Self-climbing formwork was created. Most recently, he was responsible for around 18 years as head of the research and development department, as well as for technical software development. He holds a degree in mechanical engineering and automation technology. In addition to his professional career, he is co-founder of the Platform for Innovation - PFI - The Leading Organization for innovation in Austria.

PART I

About Doka / Umdasch Group Ventures

The Umdasch Group is a Holding over three operative companies to ensure flat hierarchies and effective organisation inside the company and foster the entrepreneurial spirit. The role of Umdasch Group Ventures in the Umdasch Group is to focus on new and revolutionary business models and disruptive technologies in building. Umdasch Group Ventures is a 100% subsidiary of the Umdasch Group that also consists of Doka, a formwork market leader, and Umdasch the store makers, a retail specialist.

The origins of the company can be traced all the way back to Stefan Hopferwieser, who in 1869 was granted permission to set up a carpentry business in Kollmitzberg near Amstetten in the Mostviertel region in the southwest of Lower Austria. From these humble origins emerged a company with a sawmill and a joinery. The company's development was supported by increasing industrialization, and in particular by improvements in infrastructure between economic hubs as a result of the expansion of the rail network and the associated construction orders for bridges. With the triumphant success of concrete as a building material, large quantities of concrete formwork were needed. In 1956, Doka delivered its first formwork panels for constructing power plants. Doka Austria was founded in 1958. Shortly after, in 1961, the first foreign subsidiary, Doka Germany, was founded.

In 1965, the company developed a revolutionary innovation: a large-scale formwork system consisting of just three components. In 1971, Doka's climbing formwork was introduced. The term "climbing formwork" refers to a modular solution which can be attached to and repositioned along a load-bearing system. During each new work cycle, the load-bearing system is moved in the direction in which the construction is progressing, and the formwork is attached to it.

Concrete engineering

Concrete is one of the oldest building materials ever. Its history goes all the way back to antiquity. Especially its ease of processing compared to other building materials as well as its high durability and load resistance are reasons for a success story which so far has lasted for thousands of years. One of the most famous concrete structures is the Pantheon in Rome, built in the 2nd century AD. With its 43-metre roof dome made of Roman concrete, it has so far survived for nearly 2,000 years. In the 18th century, improved cements were developed and Joseph Moniert invented reinforced concrete, for which he was granted a patent in 1867. Reinforced concrete is a composite construction material which combines the advantages of the tension-resistant steel with those of the pressure-resistant and lighter concrete; the concrete also has the task of protecting the steel against corrosion from environmental influences. By the end of the 19th century, architects and structural engineers were able to calculate the forces and stresses in large and complex structures so well that the composite reinforced concrete provided superior design freedom compared to other building materials. At the same time, construction times for large-scale structures could be dramatically shortened as a result of improved technology and quality.

After the Second World War, the development of concrete technology took yet another quantum leap. The increasing mechanical strength, chemical resistance, and better processability of concrete opened the way for the use of highly specialized concrete types in virtually all areas of construction technology.

The intensive use of concrete as a material is primarily attributable to its high cost-effectiveness. A major reason for the worldwide triumph of this construction material is the relatively high availability of limestone and clay as raw materials for cement production, as well as the natural aggregates, which are available all over the world and can be produced in large quantities by comparatively simple means. In 2004 alone, for example, 330,000 cubic meters of concrete were required for the construction of Burj Khalifa, the world's tallest building in 2018, using Doka formwork. In Germany, some 100 million cubic meters of the most important building material are processed every year.

The Doka product range includes formwork systems for walls and ceilings, as well as climbing and self-climbing formwork. The company also produces load-bearing systems as well as work platforms and protective structures. In addition to manufacturing and distributing formwork and load-bearing systems, Doka also takes care of the hire and maintenance of all necessary parts on demand.

Doka is among the world's largest suppliers and manufacturers of formwork and load-bearing systems. The company is wholly owned by the Umdasch Group, a group of companies with international operations in the wood and metalworking sectors. With over 7,800 employees in more than 170 sales locations worldwide, the Umdasch Group generates revenues of almost 1.5 billion euros, making it one of the top 40 companies in Austria. The Group also comprises Umdasch Group Ventures, a company dealing with new business models in the construction sector.

Formwork technology

Formwork refers to a mold into which the viscous concrete is poured for curing. Originally, formwork was custom-made by carpenters from spruce or pine wood. Until the 1960s, carpenters and semi-skilled formworkers were employed to perform this task at the construction site, using huge quantities of wood. The formwork was produced on site and filled with cast-in-place concrete. Cast-in-place concrete is processed at the construction site in its liquid state, and is either prepared on site or delivered to the construction site as ready-mix concrete. These individual on-site solutions were gradually replaced by complex, reusable formwork systems made of wood-based materials. Today, system formwork is almost exclusively used and applied by specially trained concrete builders. A separate formwork industry has developed and carpenters are hardly ever deployed to construction sites any longer. System formwork is one of the steps away from individual hand-crafted construction site solutions towards the industrialization of the construction process.

The concrete casting process takes place in three rough phases. To begin with, the formwork for the desired shape is erected in the desired place. It consists of a formliner (e.g. formwork panels in the case of walls and ceilings), which is decisive for the surface quality of the finished concrete, and a substructure, the load-bearing structure. This load-bearing structure must be able to support the load of the fresh concrete until the end of the curing process. The dimensional stability of the finished concrete element depends on the rigidity of its formwork structure. Subsequently, the concrete element is reinforced by inserting steel and pouring in the liquid concrete. After a certain time, the so-called stripping time, the formwork is removed and the concrete element is stripped. The criteria for the duration of the stripping time include the position of the formwork, the temperature, the type of concrete used, and the load the concrete is exposed to.

Concrete is a moist mixture of stone, clay, lime, and additives. Another relevant factor for determining the curing time is the volume-to-surface ratio. Water is essential for processing concrete as it dissolves

individual components such as the clay and prepares other components such as gravel or sand for binding. The water causes the cement to crystallize and interlock with the other components. Concrete is formed by the hardened cement paste enclosing the stone selected for each type of concrete. This process is called setting.

Concrete must reach a standard strength, i.e. a minimum compressive strength, before it can be used for construction or other building purposes. At an ideal temperature, i.e. temperatures above 12°C, and normal ambient humidity, this takes about 28 days. But even then, the concrete is not fully cured yet. Complete curing can take years.

The industrialization of construction

Shelter is just as important a basic need for people as food and clothing – in any part of the world. For centuries, the construction of residential buildings was characterized by the craftsmanship of the construction workers and the processes used on building sites. A productivity logic such as that used in the production of motor vehicles is a relatively recent phenomenon in the construction industry. The aim is to achieve high standards in terms of effectiveness, quality, and productivity in meeting the basic need for adequate housing.

Even the progressive architects of the 1920s recognized the need for streamlining the construction process, because building is first and foremost a means to an end. As early as during the 1910s, Walter Gropius, the founder of the Bauhaus art school and architectural educational institution, expressed the following point of view: "Human housing is a matter of mass demand. In the same way as 90 percent of the population today would no longer dream of having their footwear made to measure, but buy stock products instead, which, as a result of refined manufacturing methods, satisfy most individual needs, individuals will also be able to order the appropriate dwelling off the shelf in the future."

In 1924, the important architect Ludwig Mies van der Rohe made the following comment regarding the industrialization of construction: “In my opinion, industrialization is the core problem of construction these days. If we succeed in managing this industrialization, the social, economic, technical, and artistic issues will be easy to resolve.” The construction of buildings is particularly challenging in terms of logistics and transport. The development of trucks, diggers, and cranes enabled the industry to move on from the traditional technological base unit, the manual laying of bricks weighing 3 kg each, to using complete wall and ceiling elements made of concrete and weighing 6 tons each as a typical unit of construction technology. At the same time, the mass use of cast-in-place concrete with system formwork has become a characteristic of more efficient construction processes. In 1959, architect Konrad Wachsmann published a manifesto entitled “The Turning Point of Building” and stated: “At last, construction is evolving from the stage of manual labor to the era of industrialization. Finally, houses can be assembled from prefabricated parts just like cars, planes, or ships.”

The industrialization of construction is often associated with the construction programs of the USSR and the GDR, such as the introduction of the Cycle and Flow Method according to Taylor in the construction of residential buildings as a precursor of industrialization and the subsequent new construction of entire cities. The GDR was faced with the mammoth task of alleviating the housing shortage caused by the devastation of World War II in the fastest, most efficient, and most effective manner possible, which was to be achieved by moving away from manual construction. But building with prefabricated elements has also led to deeply unsatisfactory solutions from an aesthetic point of view. The prefabricated buildings of the 1970s are generally associated with desolation, monotony, and boredom. With the triumph of 3D computer capabilities and the increasing processing power of computer networks, the 1990s saw the beginning of a new era: prefabricated parts were no longer standardized, but could now be customized. This led to a veritable explosion of shapes and ideas. However, the challenge of creating “affordable housing” continues to be a problem in many countries around the world and requires further streamlining of the construction process.

The challenge: digital transformation in the construction industry

At first glance, the “bricks and mortar” branch of the construction industry does not appear to be affected by digitization at all. The apparent material nature of the building trade seems to be ill-suited to being transformed into “bits and bytes”. But especially the construction industry is living proof that it is always the financially determined levers of business models that determine the speed of digitization in an industry, and not their material or immaterial nature. From construction planning and construction preparation to logistics and customer relationships: there is a whole range of value levers which digital transformation can help to optimize from an economic point of view. Especially the still large share of manual activities, the use of empirical knowledge, paper-based processes, and various interfaces highlight the high economic potential inherent in digitization approaches along the construction value chain.

The construction industry is characterized by increasing internationalization, which is especially true in Europe, but also around the globe. In 2015, 52% of the services of the 20 largest EU construction companies were provided outside their national borders. Typical examples of the high significance of internationalization in Europe are German company Hochtief, Austrian company Strabag, and Swedish groups NCC and Skanska. These construction giants provide the majority of their services outside their own countries of origin. Strabag SE, for instance, provides 84% of its services outside of Austria. Overall, the European construction market is growing steadily, and globally speaking, there are some additional booming regions such as China. The action plan of the European Commission summarizes the most important pillars of sustainable competitiveness in the construction industry:

- Securing investments for redevelopment
- Human capital
- Resource efficiency
- Improving the internal construction market
- Ensuring industry competitiveness around the globe

In the EU28 countries, the construction industry has grown by 17.3% in real terms between 2000 and 2017. The growth rate in real terms from 2014 to 2017 was 12.7%. This is especially true for Europe's largest construction market, Germany, which grew by 12% during this period. The example of Germany also shows that the construction industry is a key sector. In 2017, the construction industry accounted for almost 10% of GDP and 5.6% of total employment. This puts the construction industry ahead of such important industrial sectors as automotive engineering, mechanical engineering, and the chemical industry in terms of both productivity and employment. This becomes evident when comparing the gross value added across the various sectors. While the agricultural sector in Germany contributes 0.7% to the gross value added, the construction industry generates almost 5% and thus approx. 25% of the total industrial output.

The entire construction industry is undergoing a digital transformation: main and secondary building trades, construction suppliers, manufacturers of prefabricated parts, and raw material specialists. Faster and more timely completion of construction projects and achieving sustainable project quality within the agreed budget are the key economic demands of construction clients. Data volumes, data formats, interfaces, and data structures are growing continuously: from the planning of architects and construction planners and production by construction firms through to building maintenance.

Throughout the construction value chain, the aim is to achieve greater agility, to make more informed decisions, and to be able to retrieve and apply knowledge in a more targeted manner.

When applying Industry 4.0 approaches to the construction industry, it is important to consider the entire life cycle of structural models – from planning and execution to operation and demolition. The integrated use of data enables a significant increase in productivity while at the same time reducing errors by allowing them to be detected earlier and eliminated at a lower cost. Especially during the construction process, it is important that the digital technology used can support work processes at any time and without disruption. This applies in particular to the design of the communication flows. At the same time, it is key that digitization leads to greater transparency and a more seamless documentation of processes. The typically applicable building contract law is based on the principle of individual contractual freedom, allowing the parties involved to make individual arrangements. The continuous digitization of the value chain is accompanied by a considerable increase in transparency, as well as increased requirements for confidentiality and cooperation, for example in the exchange of data or the use of cooperative data structures.

The use of digital technologies not only makes it possible to increase efficiency and effectiveness in existing value chains, but

also enables completely new business models in the construction industry. The new value creation potentials become evident in the use of forward-looking and adaptive information and communication technologies, which in turn translate into more effective and innovative processes. This enhances the economic efficiency of construction and operation for customers such as building owners and developers, as well as for other stakeholders such as contractors.

The main focus of the digital transformation in the construction industry is on "process safety". As a result, vehicles delivering ready-mix concrete, for example, can be located via satellites at any time and their delivery status can be determined. Furthermore, gravel, concrete, or other bulk and raw materials can be ordered on demand – online and in real time. The digitization of the logistics chain in the construction sector enables high efficiency gains. Among other things, the key goals of Industry 4.0 include enabling the communication of the requirements planning department with drivers and the assignment of drivers to transport orders, route planning with feedback to the requirements planning department in order to achieve just-in-time delivery to the construction site, minimizing storage space, optimizing waiting times, or making construction projects in inner-city locations possible in the first place. Truck delivery cycles can be calculated to the minute, taking into account all relevant factors, including AI-based learning curves, and ensuring precise delivery of the required material, including predictive production management at the concrete mixing plant. In the event of waiting times, it is possible to track exactly which truck delivered with which delivery note at what time or which driver had to wait how long. Authorities now demand digitized logistics concepts using automated documentation to make billing, complaints handling, and warranty handling transparent and secure.

Part II

IP design as a management tool in digital transformation

umdaschgroup ventures

The digital transformation is an enormous challenge for structurally complex established companies and requires leadership in change management. Digitization is more than the use of digital technologies; it entails fundamental changes in the way companies work and deliver results. This realization was one of the reasons why Umdasch Group Ventures was founded.

Digitization paves the way for new business models beyond product transactions, and companies require the right mindset to use these possibilities. Digitization brings about a fundamental change in customer relationships that requires an understanding of customer decisions along the customer journey. It also requires the ability to eliminate silos. Work is increasingly organized in task-based teams rather than in departments. Solutions require multidisciplinarity and speed is a key success factor in a digital competitive environment.

IP design enables us to protect digital business models today that will only be implemented in the future. Digitization scenarios are patented in order to create digital options for the inventing company's own further development. In addition, IP design makes it easier to think in terms of business models, i.e. to think from the customer's point of view, to overcome silo thinking, to think faster and in a more agile way, and thus to take advantage of the opportunities offered by the digital complexity.

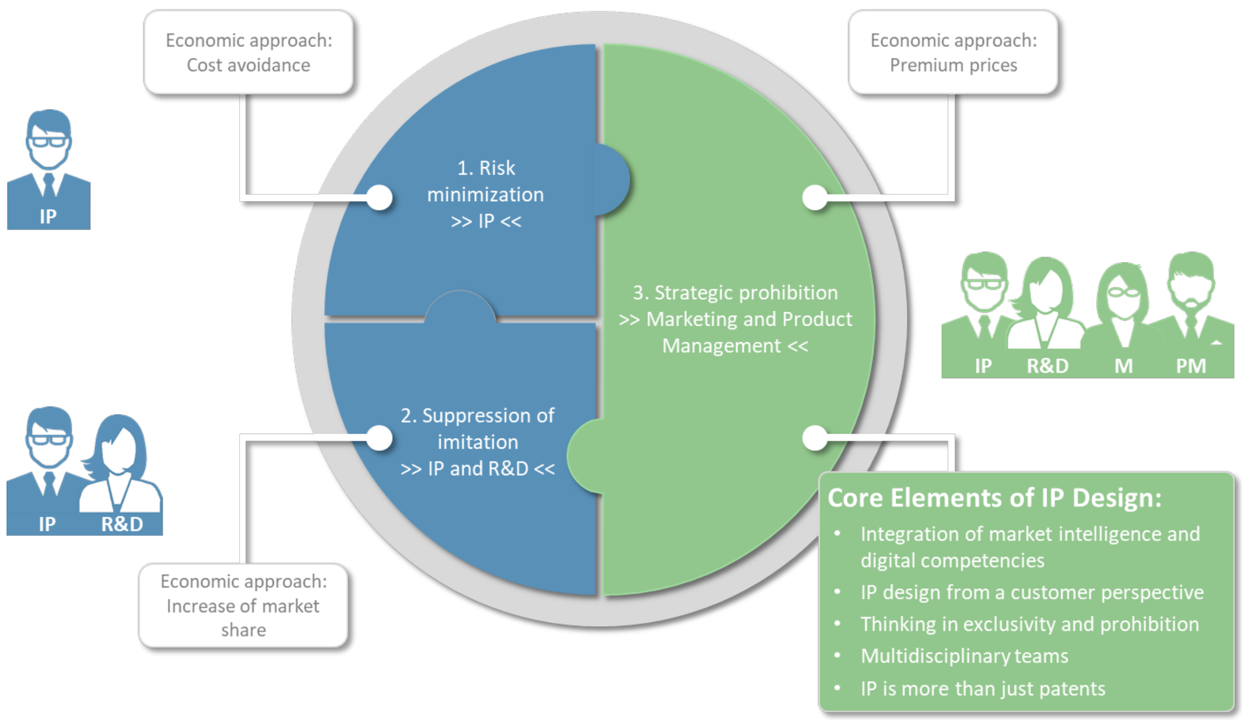
Leadership means setting clear goals and providing guidance for staff members. In today's global economy, competition no longer only takes place between goods and services, but increasingly also between people. To achieve growth, people are needed worldwide in order to develop new ideas and technologies.

Managers must lead the way to success.

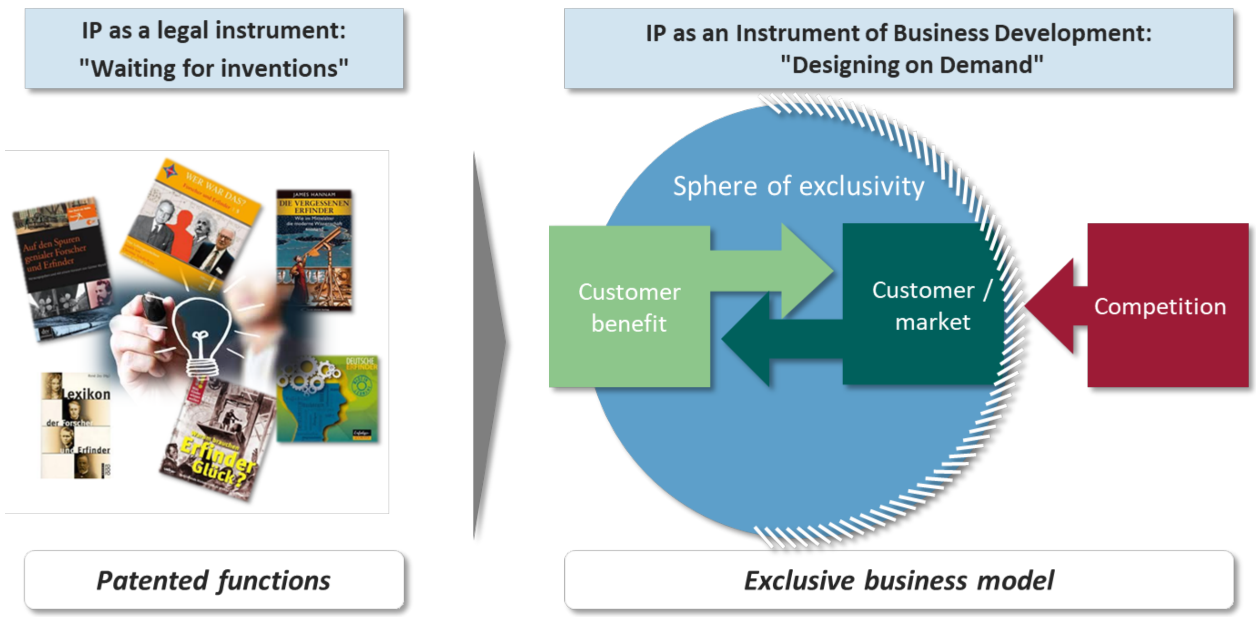
- What needs to be done to achieve the set goals?
- What measures are necessary in order to achieve them?
- Which support do staff members need to achieve these goals?

Digitization is a management task. Digitization means flatter hierarchies and decentralized authority. And management must change, too. Through the creation of new and more flexible teams and organizational structures, the manager's role is changing from that of a general to that of a navigator.

Agility and superior speed are achieved through virtual teams and structured communication. Digitization leads to greater complexity, and networking means that significantly wider system boundaries must be taken into account when developing services and business models. Umdasch Group Ventures has internalized these principles and implements them in everyday practice.



IP design is a way to structure problems and work them out systematically in multidisci-



plinary teams. IP design is a structured creative process, a method of developing innovative products, services, processes, and business models as a team – especially for digital topics.

IP design makes "waiting for inventions" from the R&D department a thing of the past. With IP design, IP is actively developed to meet the needs of business development. The ultimate goal of IP design is to achieve legally enforceable exclusivity for the business model.

IP design provides executives with a toolbox for an efficient way of working. IP design helps Umdasch Group Ventures to live and breathe the five most important leadership tasks in digital leadership:

1. IP design drives change within the enterprise. IP design shows staff members in the IP design teams that the new digital environment is not a burden but an opportunity. Change is understood as a positive space of possibilities. Designing rights prohibiting third-party access to their own business model options allows businesses to think through their options for action and protect them for their own further development. Disruptive scenarios can likewise be blocked for the competition by a company's own patent positions.
2. IP design helps to make staff performance transparent and enables recognition. Rapid changes in constellations can be dealt with and protected promptly. The IP design toolbox allows the documentation of contributions and provides a structure for solution-oriented and efficient collaboration within multidisciplinary teams.
3. IP design promotes cooperation. The tools of IP design help to facilitate efficient collaboration and to systematically collect and analyse large amounts of data, e.g. by monitoring digital business models of the competition and observing rapid changes in the digital environment. Multidisciplinary teams enable the integration of the

market and digital side into the on-demand creation of IP.

4. IP design supports staff development. High-speed innovation and change become possible through the targeted use of creativity. IP design removes the shackles of having to produce one's own developments today in order to have freedom of action in the future. It does not start with a company's own R&D efforts, but rather with describing and protecting the ultimate goal.
5. IP design provides orientation. Among the multitude of trends and possibilities, the essential options for future markets, products, and services must be identified and evaluated. IP design is a process which enables this and encourages and empowers stakeholders to engage in constant internal and external reflection.

Various business model scenarios based on Concremote® have been developed and protected by Umdasch Group Ventures using IP design. The starting point for the Concremote® innovation project was the fact that nearly 60% of work in the construction process does not produce any value added as a result of errors and defects, waiting and search times, uncoordinated construction processes, and a lack of communication. Concremote® is Umdasch Group Ventures' integration contribution to BIM (Building Information Modeling), a tool for interactive and seamless process optimization over the entire life cycle of a building. BIM is a planning and control concept that manages the entire life cycle of a building by means of virtual digital building information. BIM is not a piece of software itself, but rather the description of a method for the optimizing the planning, execution, and management of buildings with the support of software.

To this end, all relevant building data such as the optimum stripping time are digitally recorded, combined, and connected in the best possible way. The Concremote® sensor solution provides data on the temperature and strength development of concrete in real time, which is crucial for the construction process. With Concremote®, the cycle time for the formwork of a typical 47-storey high-rise building such as the 155 m tall Highpoint Tower in London can be shortened by one day per cycle and floor. This corresponds to a productivity increase for the creation of the building core by a total of 47 days and therefore about 20% when using four Concremote® sensors.

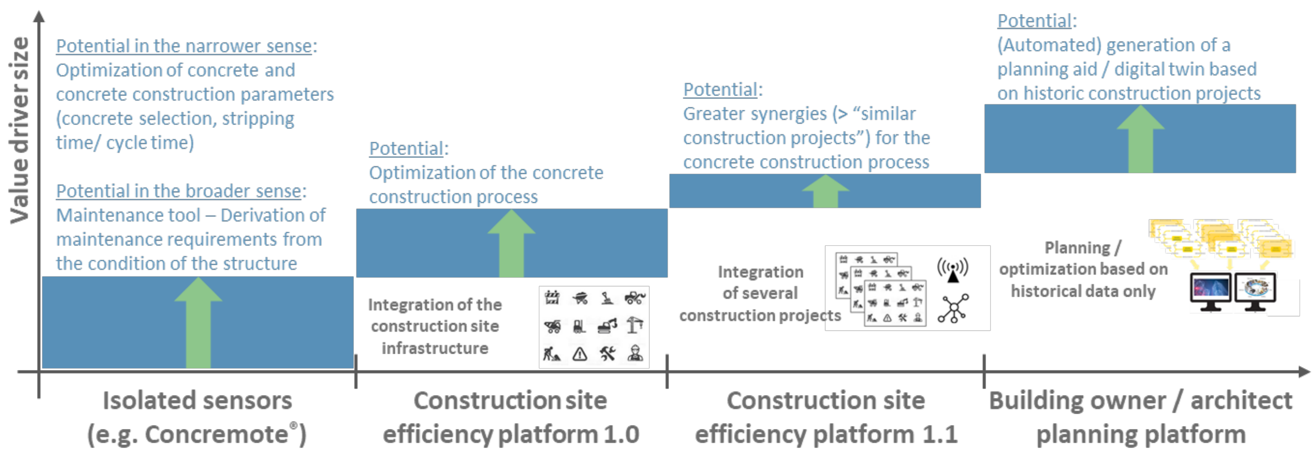
Concremote® helps to find the earliest possible stripping time for construction projects and thus reduces cycle times in concrete engineering. The available data can also be used to check the suitability of proposed concrete formulations and carry out optimizations, for example during the construction of Canada's second-largest hydroelectric power plant Muskrat Falls at ambient temperatures as low as -40 degrees Celsius during winter and as high as +30 degrees Celsius in summer. A total of 35 Concremote® sensors were used for the Muskrat Falls project. Avoiding cracks is absolutely paramount in the construction of the 824 MW hydropower plant. With hundreds of readings, Concremote® was able to ensure reliable on-site temperature control and therefore the quality of the bulk concrete used.

The transmission of real-time data makes Concremote® successes measurable and tasks related to formwork and in-situ concrete easier to manage. Concremote® uses two types of sensors for its readings: a wireless ceiling sensor inserted in the fresh concrete of in-situ concrete ceilings after screeding, or a wired sensor which comes with a wall sensor and can be installed directly in the formliner of the wall formwork and/or coupled with additional wires in the concrete.

These sensors measure the temperature development of the fresh concrete at regular intervals and transmit the data to the Concremote® data center of Dutch technology firm Concrefy, which the Umdasch Group acquired in July 2016. This is where reliable and standard-compliant information about the strength development of the concrete is computed and made available to the construction site in real time. The data can be retrieved at anytime and anywhere via a secure web portal on notebooks, tablets, and smartphones. In addition, users can be noti-

fied of the early strength and temperature development via e-mail or text message. This enables construction site supervisors such as the foreman to set accurate time lines for stripping, post-treatment, and the earliest pre-stressing time. Measuring the heat development is key in order to monitor tensions in the component due to temperature differences. This helps to avoid cracks and subsequent structural damage.

IP design enables the think-through of additional business model scenarios based on Concremote®.



Concremote® is an integrated sensor technology for measuring construction site efficiency which can help to optimize the concrete pouring process, for example by recommending concrete formulations in line with the local availability of building materials and environmental conditions. This capability is in turn the basis for making different construction sites comparable in terms of their requirements and solutions. Based on this, a planning platform for clients and architects can be designed.

How does IP design work as a management tool?

IP design is a tool for designing creative processes. Staff members are encouraged to apply their creative skills in a focused and targeted manner in order to think through and protect digital business models. The IP design process is divided into two main stages. During the first stage, the business model is used in order to derive what IP is needed. During the second stage, the identified IP needs are met.

A methodological structure ensures that the desired outcomes are achieved in a transparent and comprehensible manner during the individual steps. Positive thinking in terms of options and alternatives motivates team members to get involved. IP generation is decoupled from technical R&D in order to make it agile, thus using the digital complexity to shape opportunities in potential eco-systems. Step-by-step process execution increases the controllability of the creative output and the predictability of the results. Ultimately, it is sufficient to describe the solution in order to create prohibitive positions. Developing it is not necessary. This means that positions can be protected today which might be used in real-world business model development in the future. Especially in the case of digital eco-systems, the early occupation of strategic positions is important as the competition also needs nothing more than a description of the solution in order to obtain prohibitive rights.

How can IP design be used by executives?

The key success factor of IP design as a management tool is a systematic focus on business models as the starting point for designing prohibitive rights, as IP design sets directions and goals in order to make visions and scenarios conceivable. The conventional use of patents is aimed at the inventor. With digital and software-oriented technologies, the business model becomes the starting point for IP generation. As a prohibitive right, intellectual property has entirely different effects on the resource and market sides of business models.

On the resource side, IP is used in such a way that so-called VRIN resources are created. VRIN is an acronym which stands for the characteristics of key resources: valuable, rare, imperfectly imitable and non-substitutable. On the market side, IP is used to influence market forces, i.e. the rivalry between competitors, and the bargaining power of suppliers and customers. In addition, the market entry of competitors and the introduction of alternatives to the patent owner's own products or services in the eyes of the customer are to be prevented.

IP design helps to describe the business model in such a way that IP can be used directly to achieve strategic goals. Team members can contribute their respective expertise and thus complete the holistic picture of future positions in the eco-system.

IP design for developing and protecting business models

Umdasch Group Ventures is the innovation hub of the Umdasch Group and focuses on the development of groundbreaking technologies and business models in the construction industry. The deliberations on business models have also triggered a debate on success factors and typifications of business models as such, as well as their constituent elements. Descriptions of these deliberations in the context of digital business models have been emerging especially since the beginning of the so-called "New Economy". All business models based on Concremote® data are digital business models, given that their success essentially depends on the targeted and business model-oriented processing of data.

Business models can be understood as an economically meaningful framework coordinating the independent action of individual employees. The constituent elements of business models are recurrent and are applied recombinantly in business practice. Digital business models can be understood as recombinant models combining similar structural components in novel ways in order to leverage different success factors.

The resource-based approach allows us to understand the company as a set of resources, which constantly adapts to changing framework conditions such as the above-mentioned developments in the construction industry. On the resource side, patents can be understood as tools for creating a VRIN quality for valuable resources. Within the resource-based view, patents ensure that resources which contribute relevant value are rare, difficult to imitate, and difficult to circumvent by the competition.

On the market side, patents can be understood in such a way that their barrier effect is used to influence market forces with respect to a company's own market position. Within the scope of the market-based view, patents ensure the suppression of substitute solutions for a company's own offerings, the creation of market entry barriers, and the undermining of the bargaining power of suppliers and customers.

Depending on the business model element in question, the exclusivity achieved by the barrier effect of a patent results in different degrees of value added within the scope of the business model as a whole. From a patent point of view, the business model is an appropriation mechanism for internalizing the prohibitive effect. In analogy to the typification of the economic effects of patents, it is also common to typify the inventive subject matter and the challenges leading to the generation of inventions, as well as the claim structures of patents. The basic approach to arriving at explanatory descriptions of the real world is to recognize recurring patterns in creative thinking and business model design.

In terms of their inventive subject matter, digital patents relate to the elements of a digital business model and the barrier effects internalized in the context of this business model. Their typification relies on recurrent objects and economic effects. Digital patent types are inherently digital to the extent that they can be used in order to protect digital business models from imitation. Descriptions of digital patent types are neither a systemization of inventive subject matters nor a classification according to claim structures (as would be the case with computer-implemented inventions). The classification of digital patents serves the purpose of identifying recurrent elements in digital business models which can be protected by means of patents and are suitable for suppressing the imitation of the business model by means of appropriately designed barrier effects.

The structure of digital patents follows the logic of business models used in Industry 4.0 approaches. A fundamental principle in this respect is the application of four distinguishable dominant logics which are used to generate economic advantages in the business models:

- competence logic
- data and information logic
- simulation and representation logic
- networking logic

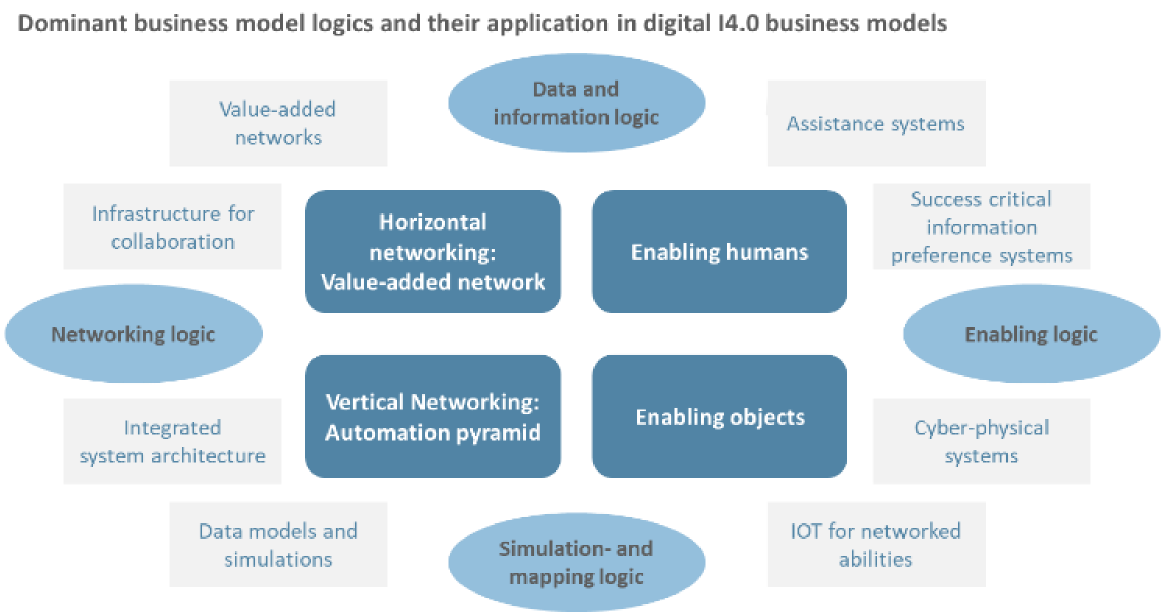
These logics constitute the cognitive map of companies implementing I4.0 business models. The dominant logic determines the relevant activities of the companies implementing these logics, e.g. the ways in which customer needs are met at Umdasch Group Ventures. Eight different technical concepts can be applied based on these dominant logics:

- Success-critical preference systems
- Assistance systems
- Cyber-physical systems
- IoT systems for networked empowerment
- Value added networks
- Collaborative infrastructure
- Data model and simulation concepts
- Integrated system architectures

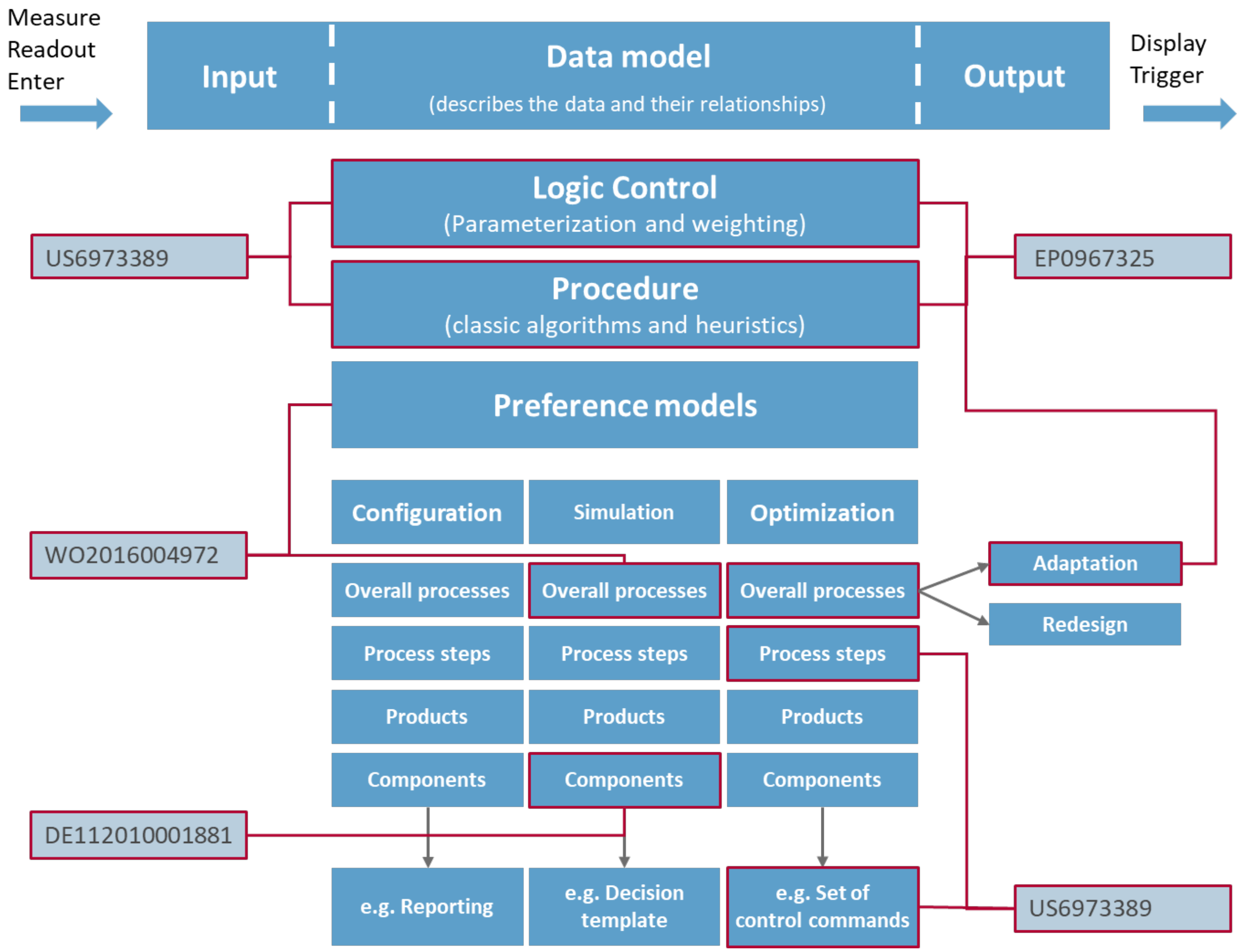
- Human empowerment (effectiveness increase)
- Object empowerment (effectiveness increase)
- Horizontal networking in value added networks (efficiency increase)
- Vertical networking within the automation pyramid (efficiency increase)

The figure below illustrates the systematics between the dominant business model logics, the technical concepts used, and the efficiency and effectiveness increases for customers and user groups.

These empirical findings result in a taxonomy of digital patents. This taxonomy is based on



The application of these concepts, which were applied in an integrated manner in the case of Umdasch Group Ventures, leads to different efficiency and effectiveness-based added benefits for customers and user groups in business models:



the dominant logics and their technical implementation in digital business models. The taxonomy presented here is a highly abstract rough structure of the typically applied digital patents, aimed at achieving greatest possible systematic consistency with the logics of business models. The figure above shows a number of examples for applicable patent types for the above-mentioned business model scenarios.

The direction of Umdasch Group Ventures' patent activities was complemented by strategic prohibition and market design. In addition to preventing the infringement of third-party patent positions and suppressing the imitation of the company's own developments, strategic prohibition is primarily aimed at marketing and product management, and at the desired positions of exclusivity in terms of the customer benefit of future business models. With this IP-strategic approach, prohibitive rights no longer result from direct proprietary R&D results, but rather from the business model and the business objectives.

PART III

Summary and benefits for Umdasch Group Ventures

Doka is one of the world's leading companies specializing in the development, manufacture, and sale of formwork technology for concrete construction. Umdasch Group Ventures actively shapes the digital transformation of the construction industry in order to make its own contribution to increasing productivity in all tasks related to formwork and concrete. The worldwide success and leadership role of Umdasch Group Ventures was rewarded with the USA Biz-Award 2018. Industry 4.0 approaches enable the company to drive forward the industrialization of the construction industry by means of new digital capabilities, thus achieving enormous increases in efficiency and effectiveness. But this transformation is not solely understood as a technological challenge at Umdasch Group Ventures. Digitization is also a challenge for corporate culture and requires the design of new business models. With Umdasch Group Ventures, the group of companies has created an instrument for developing revolutionary business models. The introduction of IP design has made available an instrument that allows new business models to be developed and protected in different scenarios. IP design helps management to implement the five most important leadership tasks of digital leadership in daily practice: driving change, making staff contributions transparent and enabling recognition, promoting interdisciplinary cooperation, promoting staff development, and providing orientation.

Contact
Alexander Wurzer
alexander.wurzer@ceipi.edu

What is the MIPLM?

The 21st century marks a new era as our economies increasingly rely on knowledge-based production processes and services. Consequently, the institutions responsible for education and research in the field of intellectual property law in Europe must provide appropriate training for staff from the respective professional environments to acquire or reinforce their ability to initiate, control, protect, exploit and increase the value of intangible assets. The knowledge-based economy integrates research and development activities, innovation, industrialization and the marketing of products and services including intangible assets and completely revolutionizes enterprise management. It creates new professions specialized in dealing with intangible assets: this branch of law attracts consultants and intellectual property experts from among managers, jurists and lawyers. Indeed, every innovation process generated by new economic activities assumes the intervention of the law, the installation of tools and structures for developing or planning in order to control the intangible assets and to optimize their valorization. It has therefore been the duty of CEIPI, University of Strasbourg, as a leading center for Intellectual Property Studies in Europe, to propose a master program on "IP Law and Management" (MIPLM) since 2005, which complements the existing training course for engineers, scientists and lawyers. This "European" master program features a continuous training scheme aimed at experts in the field of intellectual property. It provides a genuine education program based on an investigation carried out in large enterprises in Europe. The teaching staff comprises academics and experts from various countries, renowned for their work and competence in dealing with the impact of intellectual property on the policy of enterprises.

M. Yann Basire
Director General of CEIPI

Intellectual property has become a crucial factor and driving force in the knowledge-based economy. The economic development and the competitiveness of companies increasingly depend on the generation and exploitation of knowledge. Intellectual property can convert investment in corporate knowledge creation into economic benefits. Thus IP-based appropriation strategies form the basis for creating wealth and competitive advantages for companies from their R&D and innovation activities. The development and implementation of sustainable strategies for IP exploitation require a concerted integration of the disciplines involved in order to achieve an interdisciplinary perspective on IP. In a knowledge-based economy, companies can only achieve a competitive edge by combining the economic, legal and technological sciences. IP management within such a holistic approach provides optimized appropriation strategies and thus essentially contributes to the creation of wealth within a company. Accordingly, IP management needs skilled managers who can combine the economics of intangible assets in an intellectualized environment with multidisciplinary knowledge in order to maximize the benefits of IP. A new type of competencies, skills and underlying knowledge enters the arena of management and management education. The increasing impact of intellectualized wealth creation by investment in knowledge, R&D and innovation followed by its exploitation and IP-based appropriation calls for seminal new education concepts. The CEIPI program "Master of IP Law and Management" offers such a new type of management education. It follows an intrinsically multidisciplinary approach to meet the challenges and requirements of the knowledge-based economy. This master program combines legal, economic and management sciences and includes lectures from leading scholars in the field of IP law and management. Its ultimate objective is to qualify experienced IP professionals for acting as practically-skilled IP managers with a sound knowledge of the principles of wealth creation in our knowledge-based economy.

Alexander J. Wurzer
Director of Studies, CEIPI | Adjunct Professor
Director of the Steinbeis Transfer Institute Intellectual Property Management

Concepts of the Studies

Intellectual property and economics in the present context are two disciplines that exist in parallel.

Experts are found in each discipline, but with a lack of mutual understanding and training. Both "worlds" are nowadays bridged by experts, called IP managers, who link both disciplines through knowledge and experience. The CEIPI studies pursue a holistic approach and engage experts for the developing market of an IP economy. They are experts for basic economic management processes with specific assets. Management is understood in the broad sense of an overall company management and accordingly divided into six general functions:

- 1. Strategy
- 2. Decision
- 3. Implementation
- 4. Organization
- 5. Leadership
- 6. Business Development

On the basis of this differentiation skills should be allocated to management functions, and relevant knowledge to the functions and skills. The teaching concept focuses on both areas, skills and knowledge, as relevant to business with intellectual property.

Skills can be allocated to the specific management functions as relevant to the practical work within IP management. The skills are thus determined by the daily challenges and tasks an IP manager encounters.

For example, the "Decision" function includes skills such as "valuation and portfolio analysis techniques", and "Organization" as a function requires skills to manage IP exploitation and licensing including economic aspects as well as contractual design and international trade regulations with IP assets.

Special knowledge of economy and law is required in order to implement and deploy these skills in business. This includes knowledge of economic basics such as function of markets and internal and external influence factors. Additional management knowledge is also included such as value-added and value-chain concepts.

The legal knowledge includes contractual and competition law, and special attention will be paid to European and international IP and trade law, e. g. litigation, licensing, dispute resolution. Following this concept, IP law and management can be combined in clusters formed of specific skills and knowledge defined within each management function.

The lectures have a high international standard; the lecturers possess a high reputation and long experience in the teaching subject with academic and practical backgrounds.

The top-level experts come from the fields of law, economics and technology. The experts and the students work closely together during the seminar periods. Exchange of experience and, as a consequence, networking are common follow-ups.

Participants & their Benefits

This European master's program was designed especially for European patent attorneys, laywers and other experienced IP professionals.

Its ultimate objective is to qualify experienced IP professionals to act as IP managers with the practical skills and knowledge to deal with the new challenges of wealth creation and profit generation. Participants acquire first and foremost a new understanding of how intellectual property works in business models and are conveyed the necessary skills to achieve the systematic alignment of IP management and business objectives.

The course provides an international networking platform for IP managers and in addition enables participants to build long-lasting relationships and to further develop relevant topics within the field of IP management. Being part of this international alumni network also offers new job opportunities and publication possibilities.

Past lecturers and academics

Prof. Jacques de Werra,
University of Geneva

Prof. Estelle Derclaye,
University of Nottingham

Prof. Christoph Geiger,
University of Strasbourg

Prof. Jonathan Griffiths,
School of Law, Queen Mary, University of London

Dr. Henning Grosse Ruse-Kahn,
Faculty of Law, University of Cambridge

Prof. Christian Ohly,
University of Bayreuth

Prof. Christian Osterrith,
University of Constance

Prof. Yann, Ménière,
CERNA, École des mines de Paris

Prof. Cees Mulder,
University of Maastricht

Prof. Julien Penin,
University of Strasbourg, BETA

Prof. Nicolas Petit,
University of Liege

Prof. Alexander Peukert,
Goethe University, Frankfurt/Main

Prof. Jens Schovsbo,
University of Copenhagen

Prof. Martin Senftleben,
University of Amsterdam

Prof. Bruno van Pottelsberghe,
Solvay Business School

Prof. Guido Westkamp,
Queen Mary University London

Prof. Alexander Wurzer,
Steinbeis University Berlin

Prof. Estelle Derclaye,
University of Nottingham

Prof. Ulf Petrusson,
Göteborg University

Past lecturers and speakers, practitioners and institutions

Arian Duijvestijn,
SVP BG Lighting Philips

Kees Schüller,
Nestlé S.A.

Thierry Sueur,
Air Liquide

Heinz Polsterer,
T-Mobile International

Dr. Fabirama Niang,
Total Group

Philipp Hammans,
Jenoptik AG

Dr. Lorenz Kaiser,
Fraunhofer-Gesellschaft

Leo Longauer,
UBS AG

Nikolaus Thum,
European Patent Office

Bojan Pretnar,
World Intellectual Property Organization

Romain Girtanner,
Watson, Farley & Williams

Peter Bittner,
Peter Bittner & Partner

Prof. Didier Intès,
Cabinet Beau de Loménie, Paris

Malte Köllner,
Köllner & Partner Patentanwälte

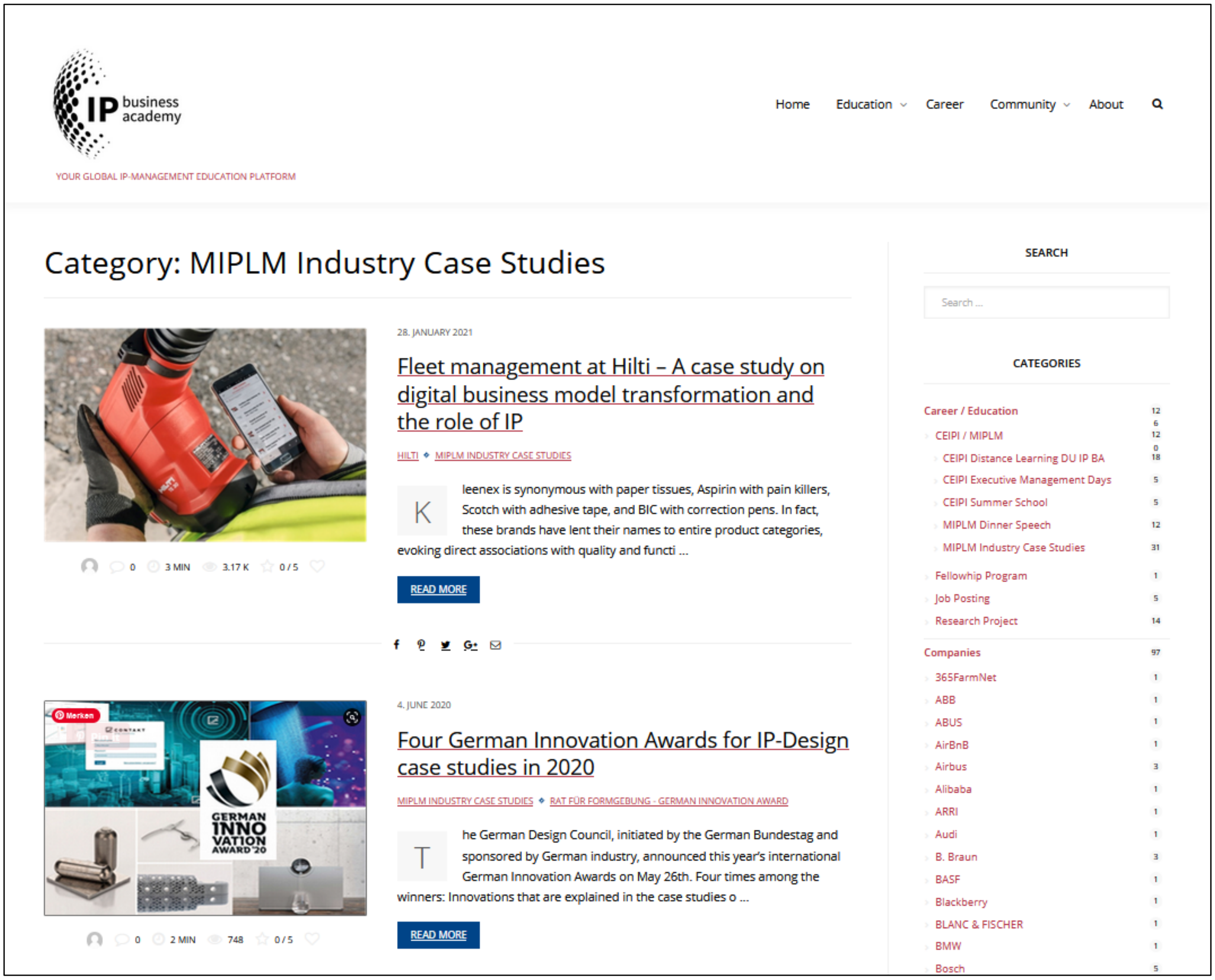
Dr. Dorit Weikert,
KPMG

Keith Bergelt,
Open Innovention Network

Selected companies

3M Europe S.A.
ABB Corporate Research Center
ABB Motors and Generators
AGC France SAS
Agfa Graphics
Air Liquide
Airbus Defence and Space
Akzo Nobel NV
BASF Construction Chemicals
Boehringer Ingelheim Pharma
British Telecom
Clyde Bergemann Power Group
Danisco/Dupont
DSM Nederland
Fresenius Medical Care
Groupe Danone
Jenoptik
Kenwood
Nestec Ltd
Novartis AG
Philips
Pilkington
PSA Peugeot Citroen
Rittal
Sanofi/Aventis
SAP SE
Schlumberger Etude&Production
ST-Ericsson
Tarkett GDL
Total S.A.
UBS AG
Unilever

Follow us on: http://ipbusinessacademy.org



Weitere Fallstudien finden Sie unter

www.wurzer-kollegen.de/fallstudien