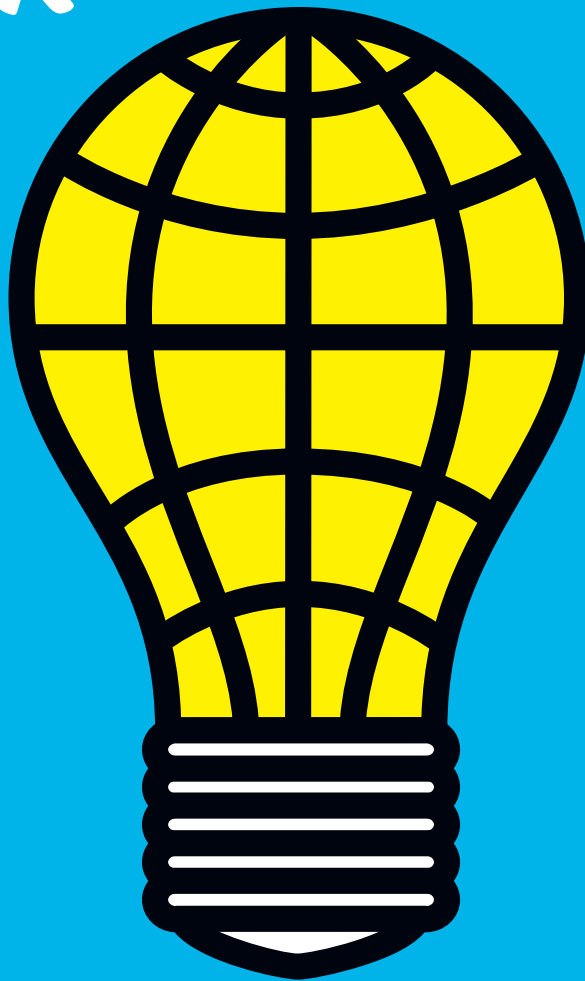


**NEW
WORK
ORDER**



**CREATIVE LEARNING
ENVIRONMENTS**



BIRGIT GEBHARDT
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LEARNING IN THE WORK ENVIRONMENT

LET'S BEGIN WITH SOME GOOD NEWS: IN THE FUTURE, WORK WILL BECOME MORE VARIED AND CREATIVE — AND WE'LL BE ABLE TO LEARN FROM IT!



Hendrik Hund
*Chairman of the Interior
Business Association*

Let's create spaces where the paths of new ideas, which often branch out widely, can be explored and a culture of creativity and learning can arise.

For the last two decades or so, digitisation has been shaking up traditional business models and forcing organisations to adopt more agile work structures (like those described in the NEW WORK ORDER in-depth study “Organisations in Transition”). Today the structural transformation is affecting occupations, and thus every single worker. Work performance is about to be redefined. Knowledge workers have to use networked media and smart systems, while at the same time strictly distinguishing between their own skills and those of algorithms and robots.

WORK ENVIRONMENTS ARE BECOMING LEARNING ENVIRONMENTS.

In the future, the human work environment in the idea-based economy will be oriented toward problem-solving skills rather than process efficiency. The complex spectrum of tasks will have to be mastered through cooperation, transdisciplinary work and a variety of communication tools and learning techniques — so it will no longer be enough to call for flexibility and informal communication. We will have to enable creativity, cooperation and mutual learning through methods that are more individualised and diverse. The office environment must be reorganised to facilitate the activities still performed by people. At the level of functions and emotions, it must support the agile way people work.

Human work will consist of learning that is communicative, collaborative, interactive, experimental and creative. Fortunately, today learning itself is being redefined: playful learning experiences and integrated learning systems are increasing the attractiveness of learning. “Blended learning” is bursting the bounds of institutional education, making use of augmented reality, merging with entertainment and becoming available 24/7. Just as social media have expanded our communication, integrated learning experiences will boost our knowledge acquisition in the office. This study has compiled expert opinion from the fields of education, brain research, psychology, experimental research, communication, architecture, design and art. It also deals with new learning environments, where the next generation is already employing new and varied learning methods.



Katharina C. Hamma
*Chief Operating Officer,
Koelnmesse GmbH*

“Rethinking work — creativity works” is the motto of ORGATEC 2016. It also applies to this tour through the world of learning and creativity. In addition, this study already points to one of the main themes that the leading international trade fair for modern work environments will address in 2018: corporate culture.

THE AUTHOR

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Birgit Gebhardt is a trend researcher who focuses on the future of the work environment. She supports think tanks, promotes the development of an agile leadership and work culture, and offers future-oriented learning resources. Her consulting work is based on 12 years of project management at Trendbüro, whose Managing Director she has been for five years.

NEW WORK ORDER

Research series on networked work culture
www.new-work-order.com

The research series NEW WORK ORDER was launched in 2012 to examine the transformation of office communication. It was followed by the in-depth study “Organisations in Transition” (2014) and the current study, “Creative Learning Environments”. These qualitative studies were prepared by Birgit Gebhardt for the Interior Business Association (IBA).



NEW WORK FOR HUMANS

THE NETWORKED ECONOMY REQUIRES NEW TASKS AND SKILLS.

It won't be long before a pallet of yogurt containers is able to organise its own transport from the courtyard of a dairy in Bavaria to a supermarket in Kiel. In the future, a combine harvester will set out for work on its own after the dew sensor has opened the barn door and the ESA satellite has compared the weather forecast with the real-time images of the crop's current degree of ripeness. Farmers will receive these data systems from big agricultural companies as part of their leasing contracts.

The consequences of automation, which were described in the second NEW WORK ORDER study, are not confined to the assembly lines of Industry 4.0. Across sectors and industries, remotely monitored automatic processes will operate autonomously as a matter of course. Adaptive algorithms will make decisions. Functions will be independent of machines and physical settings, becoming agile data packages that connect the hardware and software that are needed for each particular task. The pallet of yogurt containers will communicate with the autonomously driving truck convoy and receive congestion warnings to feed into logistics decisions.

THE BOUNDARIES BETWEEN SECTORS AND INDUSTRIES ARE DISSOLVING — AND NEW SKILLS ARE BEING DEFINED.

In Europe, Germany's Industry 4.0 is regarded as a leader in its very successful field of work, industrial production. In line with the new logic of networking, a producer of compressors now sells its customers not compressors but cubic meters of compressed air. The logic of production is being transformed into a service provision mentality; companies no longer earn money through machines but "only" by providing and safeguarding the work output of their machines. In this example, the machine still stands on the customer's premises, but the added value comes from the framework contract, which includes maintenance, flexibility and performance optimisation. The switch to networked services combines economic interests with technological progress. A win-win constellation that is beginning to trickle into our daily lives is the "Internet of Things and Services", a permanent process of information sharing that interweaves supply and demand, people, machines, sensors and software.

>>> We estimate that 65 per cent of German workers can make themselves fit for Industry 4.0 through further training.

Constanze Kurz
Head of the unit "The future of work" on the Management Board of the trade union IG Metall

CUSTOMER ORIENTATION WILL BE CRUCIAL; COMMUNICATION WILL BE ESSENTIAL.

In this future scenario, we must redefine work performance, the distribution of responsibilities, and business models. Just as industrialisation meant orienting business and work processes to the mass market and machine production, the idea-driven economy will orient itself to synergetic networking. Its key element will be customer orientation, while the linking force will be real and virtual communication by human and digital players who can, and should, participate in the related decision-making.

For the age of digitisation that has begun, we need to learn two things. First, we must learn to communicate and collaborate with smart systems. Second, we must reenergize the human and creative qualities that distinguish us from these systems.

HUMAN SKILLS ARE GAINING IN IMPORTANCE. HUMAN ACTIVITIES ARE BECOMING MORE CHALLENGING.



Alison Sander

Director of the Center for Sensing and Mining the Future, The Boston Consulting Group (BCG), Boston, Massachusetts

It's interesting to note that the smart algorithms and robots themselves — if knowledge workers know how to use them — are opening up areas of activity that offer people more independent access to knowledge, creativity and empathy. Thanks to available real-time data, knowledge workers can search for solutions in more independent and customer-oriented ways. When they network with brilliant colleagues, they benefit from the progress of knowledge; thanks to gaming, virtual and augmented reality, they have access to diverse formats for communication and individually adaptable learning.

As a result, networking encourages people to break out of dull routines and focus once again on human abilities: the creative generation of ideas, empathetic understanding of customers, intuitive interaction, emotional and rational understanding, and individual attention and team spirit in the workplace.

>> The digital change demands new skills, competences and service ideas. Jobs for humans in the future could include: genetic counsellors, anti-ageing specialists, augmented reality authors, urban natural disaster mitigation experts, private security counsellors, clutter consultants, urban farmers, pet psychologists and all sorts of computer and software specialists including maintenance and upgrades for robots.

TASKS FOR KNOWLEDGE WORKERS PROBLEMS AND SOLUTIONS

Creative and conceptual work that is variable and complex, and focuses on human interaction.

CUSTOMER ORIENTATION

+++ AND INDIVIDUAL SOLUTIONS ARE INCREASINGLY BEING EXPECTED from industries and service providers. Instead of providing standard responses, companies must develop special product designs and adapt their processes. Project teams work outside fixed routines and use interdisciplinary learning methods to develop customer-specific solutions, possibly improving existing company standards in the process.

TROUBLESHOOTING

+++ AND RATIONAL INTERVENTIONS prevent risky automatic processes and reveal system errors and illogical reasoning. Tracking systems report data about the general environment, but can't make the right decision for every situation. People configure and adapt measures on the basis of experience, knowledge of contexts, analytical ability, moral values and feelings.

SENSITIVE ANALYSIS

+++ OR CURIOSITY, TACT AND ATTENTION to transformation, changing trends and mood swings are important, not only for evaluating one's sensory surroundings. Experience-based combinations of cultural, trend and linguistic competence, psychology, rationality and intuition are also valuable for interpersonal communication and the interpretation of behaviour.

DEVELOPING IDEAS

+++ OR DESIGNS means more than making random connections — which computer programs can also do. It means defining problems, asking the right questions, and looking for solutions in creative and transdisciplinary ways. External experts and creative methods help to embed smart ideas in new contexts.

EXPERIMENTING

+++ AND TRYING OUT NEW THINGS are becoming the core features of the idea-based economy. Formulating research questions, planning experiments, boldness and risk remain in the hands of people — even though many other processes are digital. Open-source models connect specialised knowledge from all over the world. Virtual and augmented reality support imagination, feedback and funding. The "rapid prototype" in its test environment shortens development times.

RESPONSIBILITY

+++ FOR ONESELF AND ONE'S OWN ACTIVITIES cannot be transferred to algorithms. Self-organisation implies self-management and foresight in the company's interest, keeping the possible consequences in mind. When individuals make assessments of this kind, it helps to have contextualisation, multiple perspectives and a well-developed culture of dialogue and feedback.

LEARNING IS BECOMING ATTRACTIVE, CREATIVE AND INTERACTIVE

Why future human work will mean learning.

In the future, people will spend much more time on creative activities. The creative economy demonstrates how the tertiary sector has been able to benefit from networking and expand its range of services. Thanks to digital technologies of interaction and presentation, it is becoming easier to discuss and implement ideas.

In work environments, skills such as finding individualized solutions for customers, translating ideas into different contexts and implementing them in feasible prototypes are becoming increasingly important. That's because digital methods are helpful both as presentation technologies and as approaches to problem-solving — and problem-solving is the central task of knowledge workers.

Because of the large variety of methods, a creative and playful approach and broad availability, the connecting path towards this goal should be regarded as a key to relearning the learning process itself in all its diversity.

Learning can take place without any limits in terms of time, place, source and authorities. Opportunities, formats and certificates are competing in the global marketplace. The entire landscape of education is reinventing itself. In the virtual realm, adaptive systems are expanding our capabilities in daily life as well as the work environment. As in a physical/virtual game of ping-pong, they are increasing our learning experiences and level of performance.

AN EXPANDED SPECTRUM OF SERVICES ARCHITECTS AS AN EXAMPLE

As we try to imagine future work environments, it helps to take a look at professions that have already been working in networks for a long time — for example, the creative professions.

INTERDISCIPLINARY AND DIGITAL

COOPERATION ON A DOCUMENT BY VARIOUS DISCIPLINES: In the past, a house could be built on the basis of a few hand-drawn plans; today, many disciplines are combined digitally in a professional planning process to meet increased demands via digital production methods.

NEW PLANNING SOFTWARE

CREATES TOTALLY TRANSPARENT INFORMATION: The new Building Innovation Modeling (BIM) planning software backs up every line with information about the author, the qualities of the component, the implementation and instructions about care and maintenance.

SUDDENLY POSSIBLE,

THANKS TO 3D VISUALISATION TECHNOLOGY: Sophisticated visualisation technologies ranging from perspectives to virtual tours of a 3D model make it possible to more directly create complex construction concepts such as multi-curved surfaces, communicate these concepts and raise expectations.

MORE OUTPUT

AT HIGHER SPEEDS: The new opportunities created by digitisation have also increased expectations and requirements. For architectural work, this does not mainly mean a reduction of human labour; rather, it means increased productivity and speed, as well as a broader range of services.

THE FUTURE OF LEARNING HAS BEGUN HOW WILL WE LEARN?

What kind of self-perceptions will drive us, and what factors will make learning easier?

LIFELONG LEARNING

+++ SELF-DIRECTED AND CONTINUOUS LEARNING

People are increasingly realising the need for lifelong learning. Knowledge workers are interested in continuous self-development, both on the job and during their free time. Many hybrid infotainment formats are making learning easier and more enjoyable.

SELF-MANAGEMENT

+++ INDIVIDUAL RESPONSIBILITY

Self-management, problem-solving and transformation skills are the abilities that managers, employees and children learn today in state-of-the-art schooling concepts. Even more important than learning specific skills is learning how to learn — via the tools and methods of self-management, problem analysis, creative problem-solving, multiple perspectives and sensitivity to contexts. Through the use of learning techniques, people learn about themselves: their talents, weaknesses and favourite methods for balancing them.

GLOBAL ACCESS 24/7

+++ KNOWLEDGE IS ALWAYS AVAILABLE ONLINE

For research and advanced training, a wealth of knowledge is offered by media, organisations, educational institutions and individual experts. Conference streaming, massive open online courses (MOOCs), e-books, videos and mixed formats such as webinars and online tutorials offer expert knowledge, generally via mobile devices independent of specific times and places. Variety and availability enable customisation and integrated learning concepts (blended learning). Libraries and universities are making their holdings available online and adapting their opening hours to 24/7 learning.

CUSTOMISATION

+++ MICROLEARNING INSTEAD OF MEGAPROGRAMMES

The materials to be learned are filtered and individualized according to the learner's career planning, interests and skills. Training programmes must be opened up to individualised user filters, and educational organisations must network with other providers in order to receive attractive and flexible offers. Universally recognised credit points make it easier to document individual knowledge. Service providers in the USA are already using this tool to create job application profiles that include the related social skills.

LEARNING ASSISTANTS

+++ TEACHERS AS DEVELOPMENT ASSISTANTS

Teachers and trainers consider themselves development and learning assistants. Trainers link problems with specialist knowledge and help groups develop their own paths to a solution. Their task is to reveal and inspire existing potential. In the spectrum ranging from (virtual) discussions to entire educational processes, they are enablers, not instructors.

PEER LEARNING

+++ LEARNING AS A MEMBER OF A GROUP

Children and adults alike learn with fewer inhibitions from siblings, friends and colleagues with whom they have relationships built on trust. Individuals decide for themselves how much they adopt from others, and their personally chosen models are easily accessible in terms of their skills, age and social status. In order to learn methods and how to use media, knowledge work requires observation, questioning, copying and feedback.

CONTEXT-BASED LEARNING

+++ EXAMPLE-BASED AND SITUATIONAL LEARNING

Learning with the help of concrete examples helps individuals remember and use what they have learned. Interdisciplinary topics, outsiders' viewpoints and the repeated translation of learned materials into a series of new contexts expand the range of possible use. Thanks to learning aids that can be adapted to individual needs, people can also learn new knowledge directly in the situation in which they have to use it. Short lectures are more helpful than error messages. Individual progress determines the pace of the work. Software and users learn from the users' mistakes.

SCENIC LEARNING

+++ VIA GAMING AND VIRTUAL REALITY

Visualisation technologies can either stimulate the user's imagination by means of playful contexts, represent challenging scenarios through virtual reality, or insert important information into the user's immediate learning environment. In the physical interaction process, role-playing, storytelling and "Lego Serious Play" supplement scenic representations.

ON-SITE LEARNING

+++ UPGRADING ON-SITE ENCOUNTERS

The more we work together at the virtual level, the greater becomes our wish to meet in real life. As a result, local meetings are becoming enhanced experiences. Opportunities to share personal experiences are valuable, and they are greatly appreciated. Small groups of learners clustered around experts are regarded as a luxury. Local business meetings are increasing their informal socializing activities.

URBAN LEARNING CULTURE

+++ INTEGRATING LEARNING ENVIRONMENTS

Event and adventure worlds that blend consumption and culture are increasingly integrating learning experiences. Media and architecture are merging to create adventurous voyages of discovery; museums and science centres stimulate a variety of senses. And in brand communication, interactive learning experiences have a more lasting effect than actual consumption.

Digital competence is increasingly becoming the precondition for successful participation in work environments. It's also the precondition for self-determination and overall evaluation skills in the digital world — as workers and as consumers and citizens.

Digital Strategy 2025

German Federal Ministry for Economic Affairs and Energy



Dr. Thomas Tillmann
abc tillmann — consulting in education

>>> In the USA, users already combine face-to-face learning situations with digital learning tools as a matter of course.

Photography: Leni Moretti

BLENDED LEARNING

The new diversity and attractiveness of learning must now be carried over to the organisational level.

Germany is only in the midrange
 Only 30 per cent of the students in German schools regularly work with digital media; according to the global ICIL study, the international average is 52 per cent. The study concludes that the use of computers in German schools is much too rare, not very relevant and rarely cross-disciplinary.

ICILS (International Computer and Information Literacy Study) 2013
 German Federal Ministry of Education and Research

In the future, media-savvy learning enthusiasts will continue to try out new methods in office work environments. Specifically, learning on the job will be made possible by a broad repertoire of blended learning opportunities.

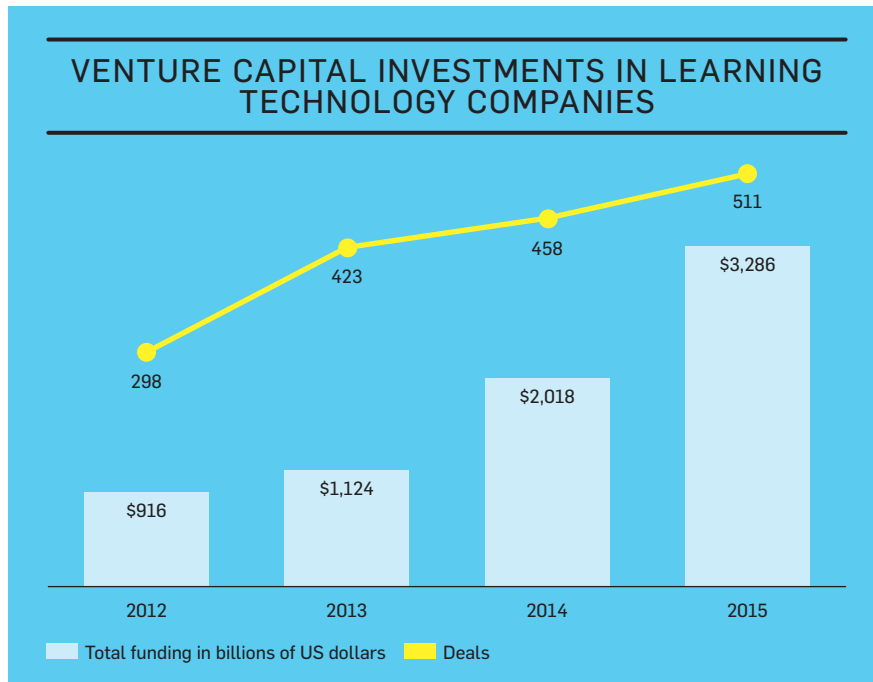
The connected work environment will not only offer access to data and information but also integrate a vast number of sources, formats and techniques for learning that can be adapted to meet individual needs. Depending on the task, the situation and personal preferences, the user can take advantage of digital and analogue tools in a targeted learning arrangement. In return, interactive tracking software and adaptive learning systems can react to users' individual learning speeds and their current ability to concentrate. Active and passive contact points will support users as they solve problems and award them with new insights.

BLENDED LEARNING MEANS BLENDED WORKING.

Together with the countless learning opportunities, the spectrum of communication and networking within organisations is also increasing. Work environments are becoming richer in terms of sharing, content and diversity. At the organisational level this is primarily expressed in open, communicative and self-determined structures.

>> We cannot teach people anything — we can only help them discover it within themselves.

Galileo Galilei
 Philosopher, physicist, mathematician and astronomer (1564–1642)



The market for intelligent learning systems is booming. Investments in learning technology companies have been rising since 2012. In 2015, more than \$3.3 billion was invested in the field of education technology. In the same year, global funding for education technology was the second-largest investment category for venture capitalists.

CB Insights
 Global Ed Tech Startup Deals and Funding, 2016

5 structural and managerial prerequisites must be met by a “learning organisation” for its knowledge workers:

1. Promoting individual self-development.
2. Taking into account mental imprinting based on personal experience.
3. Developing visions cooperatively in teams.
4. Being able to learn in and from the project team.
5. Thinking in terms of abstract systems and applying these in concrete contexts.

Peter M. Senge

Senior Lecturer of Behavioral and Policy Sciences at the Sloan School of Management at Massachusetts Institute of Technology

“The infrastructure for the learning environments of the future will be the merging of real and virtual worlds,” says the architect Christine Kohlert. She believes that interaction, cooperation and new technologies will be the driving forces of knowledge transfer.

THOUGHTS FLOW FREELY. KNOWLEDGE WORK IS COMMUNICATION AND CREATIVE COLLABORATION.

Blended learning will impact the knowledge society in the midst of its daily life. Attractive learning content is increasingly penetrating our consumption, culture and leisure activities. Thanks to virtual worlds, this content is interactively expanding our spectrum of personal experience and social impact. The world of learning is also bursting the bounds of our real physical world. Universities are transforming empty entrance halls into spacious foyers where people can meet. Connecting axes are being transformed by catering and service establishments into mall-like promenades. The models for these changes are provided not only by the urban culture of consumption but also by historical places where knowledge was shared and expanded in natural ways. Leaders and followers are getting together by analogue and digital means, in the future as in the past.



Prof. Christine Kohlert

Managing Director, rbsgroup / Part of Drees & Sommer

➤ Future teaching and work will be characterized by shared learning in small groups that work together to develop content. This generates a highly interactive kind of learning. The office will become a marketplace of knowledge. Given the increasing access to knowledge, working methods and the use of space should now also be expanded.

“THE SCHOOL OF ATHENS”, FRESCO, RAPHAEL (1509/10)

In ancient Greece, the sharing and dissemination of knowledge was not static. It took place in a variety of spaces — individually and in groups, sitting, standing and walking. Thanks to digital technology, today we have even more opportunities to transfer knowledge and engage in discussions.

Photography: The Yorck Project

CONNECTED THINKING

LEARNING MEANS MAKING CONNECTIONS.
RELATIONSHIPS FORM AT THE PERCEPTUAL LEVEL;
CELLS FORM NETWORKS AT THE MOLECULAR LEVEL.

When we learn, we perceive the connections between things that belong together such as the sun and a warm building wall. We use features such as right angles to identify an object. Our perception of a multitude of things is a challenge to our understanding: What things are logically connected, and when are things simply concurrent rather than causally connected? Also, when is the similarity of two things misleading? After all, we learn through similarities and the sensory impressions connected with them. We combine new perceptions with previous associations and experiences. The things we have learned ensure our survival, but they also influence our perceptions. Our cognitive evaluation mode goes into action even before new or unfamiliar things have had a chance to encounter our neutral curiosity.

EXPERIENCES CONSOLIDATE AND LIMIT LEARNING.



If an individual stops learning in old age, the problem is not an aging brain but rather a lack of motivation. Firm convictions are "firm" because they are coupled with the feelings we have experienced in the past. And that's why they can't be changed through explanations and good advice. People hold on to their firm convictions as long as nothing happens that really gets under their skin.

Dr. Gerald Hüther,
*Neurobiologist
Chairman of the Academy
for Developing Potential*

By contrast, toddlers absorb impressions like sponges. They taste, touch, feel, hear and see all the things, pleasant or painful, that their environment holds in store for them. Their brains work holistically. Seeing, hearing and movement are not differentiated but perceived as a synthesis of impressions. Toddlers' open awareness of simultaneous impressions is much more extensive and challenging in its complexity than our adult impressions, which are rationally subdivided, sorted away or even suppressed through selective perception. The brain activity of toddlers can be approximated by adults only under the influence of hallucinogens — in other words, when all the compartments of our neural network are uncontrollably opened, all the dams break and a flood of impressions can rush in.

When we learn, the connections we perceive generate, at the neural level, diverse and wide-ranging electrochemical reactions between cells, synapses and receptors. If necessary, new synapses and cells are created in the hippocampus. Over time, repetitions, emotions and experiences at the level of perception consolidate these "tracks" and transform the sponge into a network. The knowledge we have learned at an early age or through our curiosity shapes the fertile docking points for later learning. Even knowledge we have not used for a long time, such as a foreign language, can be reactivated with relative ease. By contrast, over the years it becomes more difficult to learn new things or even to perceive things that have not previously been in our set of relevant information.

A BROAD RANGE OF INTERESTS AND STRONG
MOTIVATION ARE HELPFUL.

In times of change, when openness and a willingness to change are in demand, it could be helpful to orient ourselves in line with creative people. In their search for usable inspiration, they continually scan their environment. They suspect that their own store of experience is too limited for the tasks they set for themselves, and this forces them to search the world for similarities and repeatedly look at it from new viewpoints.



PUPILS DISCOVER WHAT LEARNING INCLUDES

Learning environments combine inclinations, interests and methods that individual learners discover in themselves, compare with the tasks at hand, and are expected to express in diverse ways in the learning programs. Christer Gudmundsson has illustrated and described this situation — and his “Moodboards” speak to us, even though they’re in Danish.

1 With our logical-mathematical intelligence, we experiment,

invent, work with numbers, ask questions and investigate. We are good at math, logical thinking, problem-solving and abstract thinking. In the process, we categorize and classify information in order to test hypotheses and create systems.

2 There is a similar range of abilities for the natural sciences,

3 for social intelligence, 4 and for visual-spatial intelligence.

Illustrations: Christer Gudmundsson/Dafolo Frederikshavn; seen and photographed at the Ringstabeek Skole near Oslo

A learning typology based on the senses

Content to be learned enters our memories by means of the sense organs. In addition to our eyes and ears, this includes the senses of smell, taste and touch. The different sense organs are developed to varying degrees in each individual. This means that there are different types of learning — not necessarily in their pure forms but in terms of individual tendencies.

There are many ways to learn. The most familiar one is rote learning of content. The content has to be repeated frequently (more or less, depending on the individual) to consolidate the memory. The unpopular process of rote learning can benefit from multimedia assistance. Depending on the learning method, content can be transferred aurally, visually, discursively or manually. When the material to be learned is combined with sensory input, both perceptions are retained more firmly. Most people remember even today what they felt when they saw the World Trade Center crumble on September 11, 2001, and where they saw these images.

EMOTIONS REINFORCE RECEPTIVITY.

When we experience surprise, joy or fear, various brain cells spark simultaneously and form connections. Emotions create bonds between content and context. If positive emotions are associated with learned content, the content is stored in the hippocampus. By contrast, experiences associated with fear are stored in the adjacent amygdala, where they are overlaid with aversive routines and flight reflexes that block free and creative thinking. That's why it's unproductive to use pressure or fear as incentives to learn. Things that are learned out of fear will also be associated with fear when they are recalled. Successful learning can result from curiosity, pleasure, play, camaraderie and even self-indulgence. For many years, these elements were not associated with learning, because we took disciplined learning so seriously.

>>> Fear causes a cognitive style that makes it easier to execute learned routines quickly and makes it harder to make casual associations. People who have exam anxiety don't come up with the simple solutions that require a bit of creativity, which they would easily come up with under normal circumstances.

Prof. Manfred Spitzer
Neuroscientist



Dr. Gerald Hüther

Neurobiologist,
Chairman of the Academy
for Potential Development

All human beings started out their lives

>>> as discoverers and creators. They should not be subjected to the educational and training methods of others.

Photography: www.gerald-huether.de

GERALD HÜTHER LEARNING WITH PLEASURE

Learning is not effective if the learner isn't enjoying it. The prerequisite for successful learning is a basic attitude that is philanthropic and encourages people to learn together.

HOW DOES LEARNING TAKE PLACE?

GERALD HÜTHER: The brain is not a muscle. We can practice and train as much as we want, but we only learn by creating relationships with things and people. Every time we discover something that is significant for us, it gets "under our skin", and it activates the emotional centres in our brains. These emotional centres are located in the midbrain, and they are connected to all the other parts of the brain.

HOW DO EMOTIONS AFFECT LEARNING?

When the emotional centres are activated, the areas that are responsible for regulating the body are thrown into confusion. You then feel this in various parts of the body. Your heart starts to race, you break out in a sweat, you're short of breath or you feel weak in the knees. These are the somatic markers that show up if something gets "under your skin." And if you then find a solution, this confusion reverts to a sense of order. This sense of order releases neuroplastic neurotransmitters that act as a kind of "fertilizer" to stabilize all the networks that have contributed to solving the problem.

That's why you can only learn something permanently if it is emotionally charged — in other words, if it gives you pleasure. Only if the emotional centres are aroused — for example, if you've done something really well or you've gained a new insight — does your body release the neurotransmitters that lead to reshaping processes in the brain.

HOW CAN WE PROMOTE THIS PROCESS?

We should develop a culture of interaction in which we don't devalue people or treat them as objects but instead encounter them as subjects. That means we invite them into our world, encourage them, and inspire them to want different and more beneficial experiences. There are people who manage not only to encourage others but even to inspire them, because they enjoy lighting a spark in another person. They make people want to open up again, try something new, open up their eyes. And the great thing about it is that somehow it always works.

THE MEMORY: UPDATING RATHER THAN STORAGE

Our memories also help to determine what we learn and what we remember. The way our memories work follows its own logic.

Aristotle compared the memory with a seal ring that leaves its stamp on a wax tablet. The wax is liquid and remains unstamped only in the case of children and old people. In later times, this reservoir of knowledge was compared to a palace or a library. After the invention of camera technology, the ideas of image storage and pattern sequences complemented this definition. In the spaghetti Westerns of the 1960s, dying characters would see their lives running backwards. After the advent of the Internet, another element was added: the idea of networking, in which communication enables neural interaction.

OUR BRILLIANT MEMORY OUR SUBCONSCIOUS COACH

Our memories manipulate facts and influence our decisions. But these processes are benevolent, according to Hannah Monyer and Martin Gessmann.

EVALUATING

COMPARING AND IMPROVING: Our memories reflect upon processes. Our episodic memory in particular analyses our successes and failures in relation to their derivation and context. It remembers important factors, while also bringing alternatives into play so that we can optimize a similar process in the future. In other words, every insight we gain also brings in competing plans that look like "I wish I had..." with regard to the past and serve as new options for the future.

INTENDING

DEVELOPING CURIOSITY AND WANTING SOMETHING: It's not the case that we want something and our brains then add the appropriate memories. It's the organisation of our memory's content that makes us want things. The memory experiments to find out what routes are possible and where we must expect to encounter obstacles on the basis of our experiences.

STORING

PROCESSING AND CONSOLIDATING: The knowledge we have learned is transferred by the hippocampus to the storage zones of the cerebral cortex when we dream at night. The storage capacity of these zones is about 2 petabytes — about 2,000 times more than that of an aver-


age computer. The transfer takes place in various phases of dreaming in which the memory combines and composes like a creative spirit. These processes also appear to give rise to positive solutions that surprise us with their ingenuity the following morning.

REMEMBERING

REDISCOVERING AND UPDATING: When we remember things, thought packages are undone again. A stable trail of memories becomes a labile one that is open to change. The memory is submitted to a new point of view; it is linked with new experiences and packed with new information that overwrites the old memory. Every incident of remembering generates a new copy of the original and moves the original memory a step further from its origins and reality. That's because it's more important for our lives to compare memories with our personal ideas. This updating process makes us fit for the future.

COMPOSING OURSELVES

SLOWING DOWN AND REASSURING OURSELVES: If our future outlook narrows, for example through an illness, the memory doesn't plan ahead as far. Instead, it lets us look back at what used to be our perspective on a possible future. Memories of childhood bring us back to the beginning, when the whole world was still open to us.

 **Our memory is** a transformer that turns our past into our future. It functions not as a gigantic storehouse but as a network that changes its connections again and again and whose main task is to plan our future. The only things that receive a place in our memory today are the ones that can be helpful for our lives tomorrow.

Prof. Hannah Monyer
Neuroscientist
Prof. Martin Gessmann
Philosopher

Authors of Das geniale Gedächtnis (Our brilliant memory)

TARGETED INTERACTION

TO DESIGN LEARNING ENVIRONMENTS IS TO SHAPE COMMUNICATION — BOTH IN THE PHYSICAL WORLD AND IN VIRTUAL REALITY.

A learning environment is defined by its physical surroundings and the interaction that will take place there. In the age of networking, both aspects are significant. We can experience the physical learning environment in a spatial setting — indoors or outdoors, in a fixed spot or on the move. Alternatively, we can participate in a videoconference with people in another place and another culture — a setting that in the future can be animated by means of augmented reality and experienced as a shared excursion.

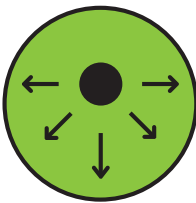
Apps and games offer interactive and animated learning environments where we can not only encounter other people but also practice new behaviour patterns in surroundings that seem real, such as a “serious game”. Firefighters use this technology to practice hazardous operations, and workers in industrial plants can use virtual-reality goggles and motion tracking to receive specific instructions for their tasks and to acquire advanced qualifications on their own.

Because the learning environment should be closely related to the workplace, virtual platforms also offer opportunities for globally networked cooperation. Giant wall displays show desktop documents, enable various combinations, and document hand-written notes.

As a result, the spatial setting of communication is becoming increasingly significant, as the following pictograms illustrate. Who’s addressing whom? What’s the purpose of the meeting? Which constellation will encourage the participants to make an active contribution? Suddenly the old question “How do the participants relate to one another?” receives a strategic spatial dimension.

The metaphorical pictograms used by Rosan Bosch are based on a theory developed by Dr. David D. Thornburg. He has defined four basic “learning spaces” with different communication flows in order to facilitate learning in more targeted ways. Bosch added the “hands-on” icon to represent a more tactile learning experience.

www.tcpcd.org
www.rosanbosch.com



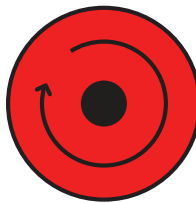
MOUNTAIN TOP

by David Thornburg

>> **One to many**

Oral presentations, live or digital performances: Readings, webinars, conference calls and similar arrangements

- + student presentation to a group
- + imparting information via a range of media
- + active presentation to the audience



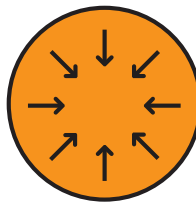
CAVE

by David Thornburg

>> **Personal learning space**

Individually selected physical and digital learning spaces for retreat and concentrated work: Individual rooms, libraries, home offices, passenger compartments, “third places” outside the office, with laptops or smartphones

- + uninterrupted learning
- + working alone
- + being concentrated
- + working quietly



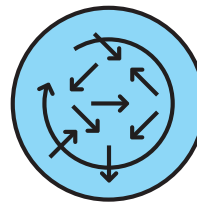
CAMPFIRE

by David Thornburg

>> **One to many, rotating**

Semi-structured collaborative physical and digital learning environments: Discussion groups, meetings, moderated game rooms and online conversations

- + group work
- + interdisciplinary teamwork
- + listening to others
- + sharing ideas
- + discussing



WATERING HOLE

by David Thornburg

>> **Many to many**

Informal gathering, physical or digital: Cafeterias, playgrounds or break rooms, halls and corridors, Wikis and social collaboration platforms

- + work in small groups
- + teamwork
- + listening to others
- + participation by everyone



HANDS ON

added by Rosan Bosch

>> **Tactile experiences:**

Enhance physical and sensory experiences in order to intensify positive incentives to learn: Through playing, exploring, and trying things out in mechanical and sensory ways

- + touching
- + holding
- + feeling
- + experimenting
- + building

ROSAN BOSCH

COMMUNICATION DESIGN

Rosan Bosch creates learning environments in universities, schools, kindergartens, exhibitions, libraries and cultural centres. Her interiors are based on archetypal communication arrangements, whose use and design has surprising effects.

WHY DO YOUR INTERIOR PROJECTS BEGIN WITH AN ANALYSIS OF THE COMMUNICATION PROCESS?

ROSAN BOSCH: Constant and connected communication has brought a huge transformation of our daily lives, our coexistence, and of course also the way we learn and work. It is also changing us ourselves, our needs and our abilities.

WHY DO YOU ILLUSTRATE YOUR COMMUNICATION TYPES WITH PICTOGRAMS?

The pictograms distinguish between communication activities with respect to their source, direction and extent, as well as the configuration of the actors and listeners. They provide the customer with a toolbox that enables him or her to distinguish between different forms of communication and thus design new services in a more targeted way. This toolbox helps schools to review the teaching formats they have used previously, make them more diverse, and encourage pupils to engage in a more self-directed mutual learning process.

THE PICTOGRAMS CAN BE "READ" AS IMAGES. THE CONFIGURATIONS INCLUDE IMAGES OF NATURAL PHENOMENA AND RITUALS THAT ALSO RECALL SPATIAL ASSOCIATIONS.

They are metaphors that we cooperatively translate into our customers' objectives. In themselves, they don't yet imply the interior or the furniture. The metaphors only help to create awareness by showing how the communication must flow in order to adequately support certain tasks and new learning formats. The constellations also include new media. For example, Mountain Top may also refer to the video of a TED conference. The pictogram simply represents "one-way" communication. This openness to interpretation is important for the use and design of the communication zones.

SOME OF THE PICTOGRAMS FOCUS ON THE PEOPLE AND THEIR RADIUS OF ACTION, WHEREAS OTHERS REPRESENT SOCIAL AND RITUAL GROUP BEHAVIOUR...

Yes, there's a mixture of both types. I think that for many of our activities there's a reason why we do them in a certain way. I also think that our bodies play a huge role in the process. The philosopher George Lakoff and the linguist Mark Johnson have described this very well in their book *Philosophy in the Flesh*. For example, we can't imagine infinity, because we are held back by the limitations of our bodies and their limited range of movement. It's true that when we are dealing with the new media in particular, we ignore our bodies' limitations and expand our presence and our sense of reality, but that does not release our power of imagination from our physical limitations. We are still the same human beings depicted in Leonardo da Vinci's drawing of Vitruvian Man within a circle and a square according to the idealized proportions of antiquity.

BUT WE TRAVEL ALL OVER THE WORLD, AND SOME PEOPLE EVEN DIVE FROM THE STRATOSPHERE. THE NEW MEDIA BEAM OUR IMAGES AND THOUGHTS EVERYWHERE. HAVEN'T WE OVERCOME OUR LIMITATIONS AFTER ALL?

What really interests me about this theory is the aspect of connection. Because if it's true that in our thoughts all of us are held back by our physical radius of action, then we've got a shared basis for communication. It doesn't matter where we come from — Iceland, Algiers or wherever — we should be able to communicate with one another, because we are subject to the same physical conditions that determine the way we think.

WOULDN'T IT BE POSSIBLE TO TRANSLATE THE IMAGES FROM THE METAPHORS INTO SPATIAL ARCHETYPES?

Do you really think so? I don't believe that we should derive spatial archetypes from the activity metaphors — at least not on the assumption that they would be universally valid. The metaphors work for our customers, our designs and the users precisely because they can be varied. People react in different ways. They have developed a variety of needs and habits that enable them to concentrate or to work within a group. That requires diversity in the way we translate the metaphors into physical spaces.

IN THE CONTEXT OF THE INTERACTIVE LEARNING FORMATS THAT ARE INSPIRED BY NEW MEDIA, WHAT ROLE IS PLAYED BY THE PHYSICAL ENVIRONMENT?

We don't know yet where the development of virtual reality will end, but I think that the more closely we connect communication with our feelings and physical senses, the more communication can be a "real" experience for us. We have developed the "hands-on" icon in order to give tactile stimuli more significance, or so that we can grasp theories and try them out. This requires experimentation areas and tools. It's important not to forget that we still have our local and real work environment in addition to the virtual one; it's something we can fall back on. Accordingly, we should endow our physical encounters and work-related meetings with more sensory qualities that we can experience physically. The metaphors can also help us to do that.

WHAT CAN DESIGN ACCOMPLISH IN TERMS OF PEOPLE'S WORK PERFORMANCE?

It makes it easier for us to learn and to work. Design is not only a matter of aesthetics. It can also have a positive influence on the quality and energy of the physical spaces in which we work. Of course it's not possible for us to create spaces that suddenly transform uncreative people into creative ones, but we can create spaces that support creative work.



Rosan Bosch
Designer and Managing Director of the Rosan Bosch Studio, Copenhagen

Rosan Bosch's studio in Copenhagen has branches in Chicago and Barcelona. Her interdisciplinary team includes architects, artists, designers and scientists. Her works range from exhibition designs to school interiors and innovation centres. Current projects include the Academy for Global Citizenship in Chicago, the Montessori School in Landau and the Children's Library in Billund.

DIRECTED AND UNDIRECTED COMMUNICATION.

If we look at the new learning environments in Scandinavian schools and universities, we are reminded of open-plan offices. They offer manifold opportunities for both formal and informal communication. It's not only a question of the atmosphere. What's especially striking is the deliberate and targeted design of sightlines, the channelling of attention, focus and overview. This approach could generate significant input for the design of learning environments in open spaces and flexible workspaces in offices.

ADULT EDUCATION AT THE VUC SYD DIGITAL EDUCATION

At the VUC Syd in Haderslev, Denmark, adults receive a second chance to get a state-supported education. Here, former school dropouts experience a huge difference from the past — in terms of learning environments, teaching media, forms of instruction and individual responsibility.

NEW FORMS OF INSTRUCTION VIA IPAD

INTERACTION THROUGH OWNERSHIP OF AND ACCESS TO DISPLAYS: At the VUC Syd, every adult student receives an iPad at the very start. This is not because the school aims to be paperless — that's only a side effect. And it's also not because the iPad (which years ago was still considered "fancy") increases the students' motivation to learn. It's because the tablet changes the way knowledge is imparted. The mobile display enables agile interaction at eye level, a freely chosen position in the room, and permanent access to content. Thus it allows learning groups to form spontaneously — something the classroom could never do on account of its focus on teacher-up-front instruction. Even smartboards direct students' attention to a hierarchy of targets: the teacher determines the content, and everyone is expected to look at the board. With the mobile tablet, every student carries around his or her own display and can use the "send" option to make content available to others. That makes students more independent of teachers and makes learning formats less limited. The tablet is an extension of the brain (knowledge storage medium), language (text programs, audio clips), the eye (camera with zoom function) and gestures (display, video). It thus puts content and communication tools into every student's hands and enables the self-directed sharing of ideas.

DIFFERENTIATING SPACES FOR LEARNING BEHAVIOUR

FROM TEACHER-UP-FRONT INSTRUCTION TO THE IGLOO CAMPFIRE: There is still teacher-up-front instruction at the VUC Syd as well. Wherever this is the appropriate instrument for transmitting knowledge, it takes place in classrooms with two big wall displays and access to the

Apple TV network. It's paperless and discursive: students can join the discussion with their own content via a second big monitor. Sometimes another class joins in via a video conference. The first 30 minutes of every hour of instruction generally take place in a previously reserved room. Here the students are assigned tasks. After that, they can flexibly move between rooms. The learning environment often changes the learning format. For example, students like to work on science themes outdoors at a decommissioned harbour basin. With the tablet's zoom function, they can examine small animals under magnification, document sequences via video and process them in the media room. To illustrate their work, they create models with 3D printers in the workshop. "Igloos" invite students to engage in round-table discussions. Students and teachers sit against the interior walls of the shell-shaped igloo. Light falls into the Igloo from above and through the side entrances. The shared information desk — the "campfire" — consists of four monitors in the middle, onto which everyone can upload his or her content.

DIGITAL CONTENT

THE DEMOCRATIZATION OF DIGITAL KNOWLEDGE: In the almost paperless school, all of the work content is digitally accessible. Teachers create their own digital content. For example, the political majorities of the EU countries in the 1990s are compared with current election results in order to discuss nationalistic tendencies. The VUC Syd uploads some of its learning content onto iTunes U (iTunes University) and invites people all over the world to share and comment. On this global platform, the students have access to related lecture series, language courses and interviews uploaded onto iTunes by hundreds of other universities, such as MIT, Oxford University and Stanford University. This broad range of content from Apple and other providers stimulates the students' curiosity and encourages independent investigation.

6 spatial insights for technology-empowered learning

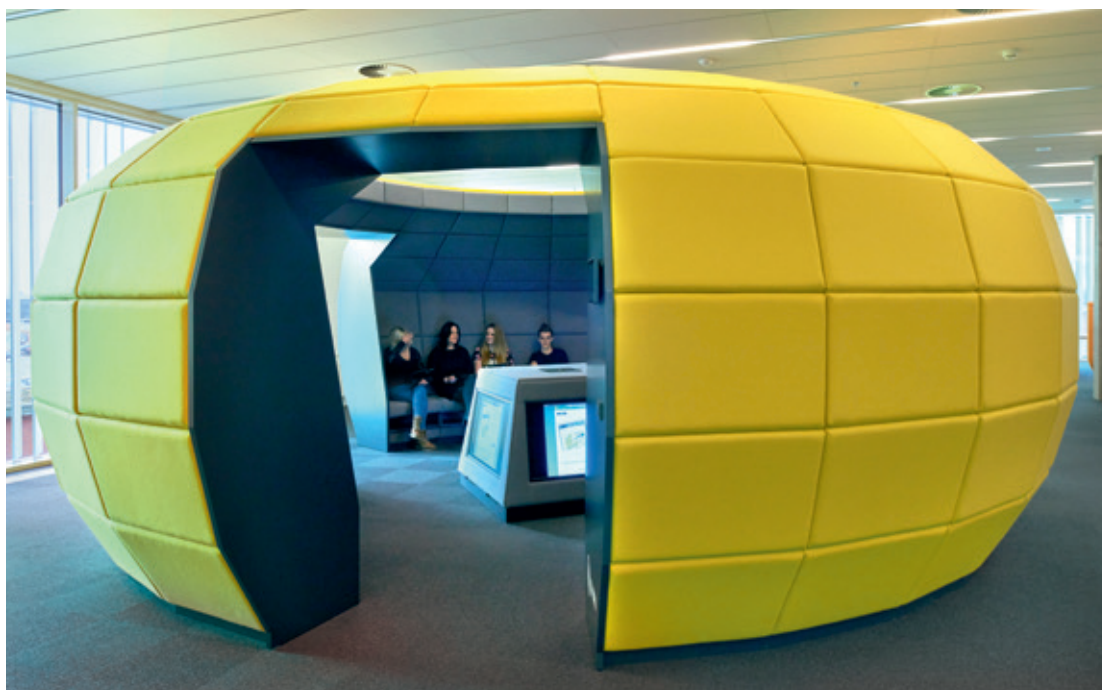
1. Personal face-to-face relationships promote successful learning.
2. Media technology enriches interactions and knowledge acquisition.
3. Integrated technology enables more flexibility and activity-based room planning.
4. Spatial limits are disappearing.
5. Spaces must capture and channel information.
6. High tech and low tech will continue to coexist.

Technology-empowered Learning: Six Spatial Insights

Steelcase: White Papers
— *Active Learning, 2016*



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OVERVIEW, INSIGHT, AT EYE LEVEL — VUC SYD, HADERSLEV, DENMARK

1 Light-flooded galleries offer insights into freely selectable learning and communication zones. Stairs and catwalks promote encounters and conversations. For the adult students who receive a second chance to get a state-supported education here, the visual design of the office environment contrasts with their earlier negative impressions of school.

2 The "Igloo" was created by AART designers for Spaces by Holmrís as a designated open space. As in a tribal palaver, the Igloo invites people to present content from their own tablets at the "campfire" in the centre of the room. It enables learning groups to retreat together and share information at eye level. The VUC Syd students appreciate the cosy effect of the seating niches, which are insulated with acoustic tiles.

Photography: AART architects, Aarhus

THE POWER OF PHYSICAL SPACE

*Or: What space does to us.
Our feelings are still stronger than our factual knowledge.*

It's not easy to reach clear conclusions about the power of physical space. Of course we ask questions about the manipulative power that architecture can generate, but this puts us in controversial territory. In view of some inglorious historical examples and the shift of the public's focus from mass production and average values to individuality and diversity, this questioning may seem outdated. Antje Flade, a specialist in the psychology of architecture, points to individual characteristics that would be hard to generalize. For example, she believes that the organisation of social interaction as a (subconscious) demand for a certain behaviour pattern or the facilitation of a certain working method are just as relevant to our consciousness as architectural influences.

In addition, brain research is not advanced enough to offer anything on the subject beyond statements about the effects of different colours ("yellow excites", "black means power/massiveness"). At present, brainwave measurements can be interpreted only with the help of familiar culturally learned patterns. But they don't help us to explain exactly what triggers a feeling of pleasant surprise when we enter a room.


However, we do know intuitively that we have an uplifting sensation if we look down from an upper storey and let our gaze glide over the roofs of a city and up into the sky. We are familiar with the sense of calm that is generated by the view of a wide landscape, or with the effect of thick green foliage in a park: our breathing gradually relaxes, the sense of oppressive heat disappears and the spirit feels refreshed. Even without a knowledge of art history, we know how inviting arcades, colonnades, galleries, atria and broad staircases can be. Our architectural surroundings are targeted at our cultural concepts, which, according to the brain researcher Hannah Monyer, support our capacity to remember things. In any case, neurologists have demonstrated how closely our memories connect learned content with learning environments. So why shouldn't we place more trust in the design of learning environments?

GENERATING FEELINGS OF WELL-BEING.

More than a thousand years ago, master builders, skilled craftspeople and artists had exactly this intention: to generate a greater sense of well-being through the effects of our physical surroundings. The Art Nouveau movement regarded a room as a synthesis of all the arts: architecture, Arts and Crafts fittings, furniture, lighting, wallpaper and textiles. In 1912 the philologist and physician Friedrich Barner commissioned the Darmstadt-based architect Albin Müller to build a sanatorium in the Harz Mountains. The architect created treehouses between the evergreens in the park to serve as health-resort huts, and for the central building he selected designs, patterns and colours that would promote healing. He wanted the building types and the interior architecture to complement the medical treatment at the aesthetic and psychic level.

This goal might have been overly ambitious. However, the relative modernity, style and harmony of the rooms impressed patients and guests alike, and their "mission" was easy to understand. Incidentally, this mission had less to do with the project's prestige than with its benefits for the users.

Companies are now combining their efforts in the areas of ergonomics, health, design and identity into the concept of well-being, which requires a redefinition of "quality of stay" and of the scope of design.

 **Mindsets are formed by rooms.** A room is never only a shell; in addition, it's always an expression of an organisation's culture. There are certain patterns that are supported by associative thinking and multi-sensory perception. These include high ceilings and a type of lighting control that is expressed in the selection of various shades and combinations of colours.

Dr. Anja Osswald
Business Development
TRLAD, DIE
DENKBANK



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LIGHT AND MATTER — DESIGNED FOR NATURAL AND CULTURAL SPACES

1 Design for a library for Mecca, 2011. In contrast to the light-flooded decorative façade, the curved walls are reminiscent of desert caves or tents.

*Design: Snøhetta Arkitektur og Landskap A/S;
Rendering: MIR*

2 Competition sketch for a Museum of Natural History in the Copenhagen Botanical Garden, 2011. Jan Yoshiyuki Tanaka, a partner at jaja architects, generally tries in his projects to create a strong connection between architecture, people and nature. Here the partially underground segments of the building open up a "secret garden" perspective.

*Design: jaja architects ApS and Kengo Kuma & Associates;
Rendering: MIR*



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INVITATION TO LEARN — SDU KOLDING, DENMARK

1 The spacious university building designed by Henning Larsen Architects houses the Design and Communication departments and is itself a design piece. The use of space and the layout and fittings are perfectly coordinated; together, they express an invitation to use them and to linger.

2 Lined loggias and integrated terraces differentiate the area along the outside of the building. The extended structure of

the façade subdivides the work spaces situated in this area and protectively partitions them off from one another.

3 Every storey is wrapped around the atrium and offers a variety of communication, relaxation and work groupings that are defined by the furniture. The building offers many gradations along the spectrum from activity to calm, extending all the way to the classrooms along the façade.

Photography: Hufton + Crow



3

LEARNICAL

HOW SPACES MAKE AN IMPACT: CODES VS. IMPULSES

Julia Dellnitz and Lars Büsing are consultants to companies that want to develop learning as a strategic area of competence. This rarely happens without interesting interactions.

WHAT FACTORS INFLUENCE LEARNING?

JULIA DELLNITZ: A variety of factors can affect the quality of learning. First of all, our emotional state is crucial. Stress and fear cause people to fall back into routines, whereas pleasure stimulates curiosity and a spirit of inquiry. There's also a strong interaction between spaces and people. By "spaces" I mean the amount of space between people and the atmosphere in which the learning is taking place. Secondly, how strong is my connection with the content? Is it related to my own experiences? Can I make useful links between it and my own activities? Thirdly, the time dimension is also important. Learning doesn't happen monolithically on a single day — even though advanced learning programs often promise that. Complex skills can be learned only in a continuous and interactive process that gives you time for reflection and trying things out. In such a process, agile methods are coordinated with the appropriate spaces.

ARE WORK AREAS ALSO LEARNING AREAS?

LARS BÜSING: Learning should not be amassed in a place that's far from the workplace, because that makes it difficult to put it to practical use. Learning must take place during work — you shouldn't separate the two! Whenever the brain switches into a different mode of operation, it would be helpful to adapt the room accordingly or to move to an appropriate room. The problem is that most rooms are multifunctional. Data input, research, knowledge sharing, discussions, conflict resolution meetings — all of them take place in almost the same settings. However, our experience has shown that different learning settings should have different spatial settings.

WHAT KINDS OF NEW SPACES SHOULD I OFFER?

L. B.: When we stage workshops and learning events for clients at their premises, we always change their rooms so that certain learning functions become possible and the steps of learning can be experienced in new ways.
J. D.: We refer to this process as "setting the stage". Features that lead to cognitive dissonance — for example, mottoes posted on the walls — have to be removed. I clear out every room before I start to work. I do this in order to have clear structures and open spaces that generate different perspectives, and also to direct people's gaze toward nature. One thing that is sometimes challenging for our clients is the fact that we want to include the cafeteria and the garden in order to spatially separate different perceptions. In other words, we want to separate initial approaches from analysis and in-depth understanding, analysis from creative work, working from planning, and planning from conflict resolution meetings.

HOW MUCH OF THIS IS APPLICABLE IN DAILY WORK?

J. D.: A conversation during a walk, broad vistas — even photo wallpaper can generate the open-minded attention

we need in order to make creative connections. Studios or workshops with tools that encourage us to illustrate something, playfully try things out, express ideas with our hands etc. could be better surroundings for a workshop than a meeting room with flipcharts.

WHEN YOU REMEMBER EXPERIENCES, YOU ALSO REMEMBER WHERE THEY TOOK PLACE. CAN YOUR SURROUNDINGS ALSO HELP TO BOOST LEARNING?

J. D.: Yes, we use them for "station learning"! In this process, the environments and their sensory stimuli have to be different. The brain can store information in 3D and in terms of visual scenes. Unfortunately, many learning environments are not geared to this capacity for perception — they are too slick and standardized.

L. B.: But a dedicated room can also be an obstacle to learning. For example, if the furniture and atmosphere in seminar rooms remind people of boring schoolrooms and teacher-in-front instruction, the rooms are negatively coded. In such settings, grown-ups easily regress into the schoolchild behaviour of the class clown or the kid who is lost in his own dreams. Rooms in which we learn something — in other words, experience something — make an impression on us and are coded.

DOES THE NEXT GENERATION HAVE NEW CODES?

J. D.: When I walk into a start-up, I feel I'm in a shared flat — that's the "co-op code" that co-ops have created to differentiate themselves from traditional work environments. They present a sense of community — with coffee, snacks and a big wooden table to show how close they are to the employees' private lives. In other words, the codes for private life and the work environment are merging. When the workload is heavy, they can also merge at the emotional level. The environment looks casual, but for the individual the situation feels very different.

DOESN'T THIS "COMFORT CODE" ALSO DEFUSE STRESSFUL SITUATIONS?

J. D.: In normal work situations, the "private life code" can have a relaxing effect, but in stressful situations this setting can quickly look fake. The cognitive dissonance creates additional stress, because our unconscious constantly compares the "code" of this setting with reality. We end up feeling we're in the wrong film. The sense that it was all phony may create lasting disappointment.

SHOULD PEOPLE STOP WORKING UNDER STRESS IN SETTINGS IN WHICH THEY'VE HAD STRESSFUL EXPERIENCES IN THE PAST?

J. D.: It's worth a try. If the environment immediately triggers a negative memory of the stress — "the overflowing desk", "the smell of this carpet", "that shadow on the bookcase" etc. — then an uncoded room would certainly be refreshing and would motivate you very differently.



Julia Dellnitz
*Co-founder of Learnical,
corporate consultant*

Julia Dellnitz studied oceanography and business administration. Today she supports agile IT projects. As the co-founder of Learnical, she supports companies that are becoming "learning organisations" — especially in the area of digitization.



Lars Büsing
*Co-founder of Learnical,
corporate consultant*

Lars Büsing began his career as a social worker. He studied economics and business administration in Hamburg and Newcastle. He has worked as a consultant and education manager in industry since 1996 and became a co-founder of Learnical in 2012. His focus is on the learning process in the digital world.

HOW SCHOOLS SHAPE LEARNING

Educators were the ones who launched a discussion about what learning environments should be like. That's why today you can find learning environments more readily in school architecture than in offices.

The new approach to instruction focuses on individual preferences, inclusion and diversity. It's based on the realization that every human being wants to learn, is curious from infancy on, and can develop his or her potential most effectively within a group for the benefit of all. This positive inner drive has been smothered by traditional school instruction, which is based on dominance, discipline and competition. But in our digital age — in which data and knowledge are widely available and pupils' individual learning profiles can be analysed — data volume, averages, and the amassing of facts are becoming less and less important. Schools are therefore switching their focus from standard methods of imparting knowledge to the development of individual potential and teaching their pupils cultural skills and problem-solving strategies.

FROM IMPARTING KNOWLEDGE TO DEVELOPING POTENTIAL.

As a result, the younger generations are learning exactly the things that change processes should bring about within companies: diversity, shared problem-solving and self-direction skills. Teamwork, collaboration and project days are already a fixed component of the learning culture in schools. Communication is taking place at eye level, teachers are becoming supporters of learning, and older pupils are taking on mentoring and tutoring tasks. The process of learning various skills and techniques should be connected with the learner's personal interests, meaningful content and worthwhile visions such as the Millennium Development Goals of the UN. That's because dealing responsibly with complex issues will literally be the overriding task of the coming generations.

ACTIVITY-BASED CURRICULA.

Up to now, the office environment served as the model for new forms of cooperation. Today, educational institutions believe their mission is to explicitly make space for a new culture of learning. Schools are offering a series of activity-based learning situations through which the pupils proceed in a natural daily process. In terms of methods as well as physical settings, this requires differentiated learning situations, direct availability and a high degree of flexibility.

The child as a master builder of himself.

This is the guiding image of the Montessori schools, which revolutionized progressive education at the beginning of the 20th century. The basic guidelines of Montessori education — open instruction, diverse and age-appropriate methods of instruction, encouraging children to explore subject matter by themselves, integrating creative forms of expression and, above all, considering and promoting each child's individual aptitudes — can be found today in almost every modern school concept.

Maria Montessori

Italian educational reformer, founder of Montessori schools



Margret Rasfeld

Co-founder of the initiative "Schools in Transition" and the director of the Protestant School in the centre of Berlin until 2016

➤➤ The old school systems make teachers the verifiers of students' deficits — and that often runs counter to the teachers' own principles. Modern schools create spaces for learning where all the students can discover and develop their potential abilities and apply them in meaningful contexts. Evaluating the students' performance by means of grades is based on an outdated philosophy of education in which punishment is a tool to optimize students' behaviour. Discouragement, shaming and fear are the logical consequences of this attitude. Knowledge acquisition is linked with the pressure of testing. If constant evaluation and strictly divided subject areas dominate the school routine, children have few opportunities to develop

their own learning methods, explore, and find solutions through trial and error. Grading systems create hierarchies and promote competition, selection and personal rivalry. Students strive to adapt their abilities to the system. However, this does not correspond to the demands of a modern working environment where teamwork, collaboration and multiple perspectives are in demand. New solutions can be found not through exclusion but through the collaboration of people with different abilities and perspectives. Focussing the learning process on cognitive knowledge and evaluation reduces learning to a single tactic with a limited impact. Learning in the sense of developing one's potential requires a differentiated feedback culture and incentives for people to continue developing, reflect on their own learning processes and assess their own performance.

Photography: Christian Klant



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ATMOSPHERE AND A RANGE OF SETTINGS — ØRESTAD SECONDARY SCHOOL, COPENHAGEN, DENMARK

1 The Ørestad secondary school in Copenhagen offers a high degree of permeability in terms of subject-related activities, natural movement patterns and different age groups.

2 The relaxation zones, "chill islands", are just as essential as the classrooms to the learning environment. Here the students don't just lounge around — they also prepare or review.

3 The spatial formats and overlapping zones created by the architects from 3XN provide students with many opportunities to get an overview, gain insights or find a quiet retreat. The "chill islands" are located in special classrooms with sliding doors to regulate how much daylight can get in. The acoustics are controlled by means of perforated doors and cabinet panels.

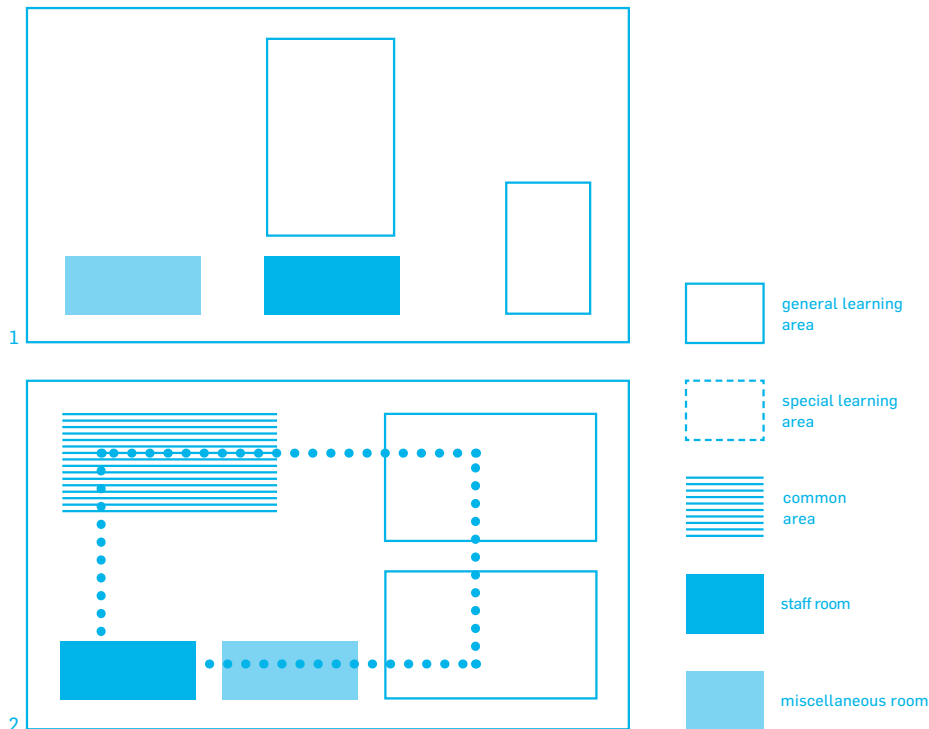
Photography: Adam Mørk

THE FLOWING CLASSROOM

*New types of learning architecture are complementing classrooms in schools.
As early as primary school, pupils can select their own learning environments in order to consolidate what they've learned or to work in groups.*

"Flipped classrooms" are learning environments in which the roles of teachers and students are redefined. The students are no longer passive listeners, but instead actively participate in shaping instruction. The subject material is learned in depth either alone or in groups, at home or at school, and then discussed with the teacher.

The worst thing about traditional learning is that what the students learn is determined by other people, limited to predefined tasks and embodied in dogmatic teacher-in-front instruction. Because teachers cannot have the answers to the questions of the future, today the emphasis is on the interaction of available skills, the paths toward a solution are more important than the outcome, and knowledge from outside the classroom has to be available. As a result, schools have begun to abandon frontal instruction in favour of periods of open learning, play and project work. Teachers are supporters of learning, and they encourage their students to use new methods, free spaces and perspectives so that they can experience successful individual learning. Architects are responding to this approach by providing flexible and differentiated room arrangements for different kinds of learning that are adapted to meet personal needs. As a result, they have created open learning environments and clusters.



OPEN LEARNING ENVIRONMENTS AND CLUSTERS

1 Open learning environment: Primary schools like to use open zones that encourage children to learn from one another across grades. The open learning approach divides up school classes several times a day and creates new groups of different sizes and formats. Another possibility is to have two learning communities, a "basic stage" and an "advanced stage", each with its own learning environment.

2 Cluster: Many schools organise their classrooms and specialized rooms in clusters consisting of three or four equivalent instruction rooms, which are supplemented by a conference and preparation room for the teachers that serves as a base for the team. The centre of each cluster is the communal zone, which is used for differentiated learning. A cluster comprises between 60 and 120 students.

Sketch: Montag Stiftung Jugend und Gesellschaft



Julian Weyer

Architect and partner
C. F. Møller Architects

➤➤ **When we started to plan the A. P. Møller Skolen** in Schleswig, open-plan layouts had replaced cubicles in office environments, and now further differentiation was necessary. Individual learning requires a great variety of different spaces so that every student can choose the learning environment that suits him or her best. In the case of school architecture, the classroom is also the place where students get to know the school system and their own role within it, find their niches and get to know their fellow students.

Photography: Henk ten Bouwhuis

At the Welsberg primary school in Bolzano, Italy, open learning environments are used by several grades simultaneously. The aim is to enable the pupils to enjoy sharing experiences and generate positive and supportive feedback among the children themselves. Accordingly, the classroom furniture is extremely adaptable and makes it possible to create a variety of separate zones. Unlike open-plan layouts, the learning environments are repeatedly changed throughout the day according to how they will be used. They must therefore be even more adaptable than offices. On the other hand, the zones should invite the pupils to engage in different kinds of learning experiences. That requires more variety, because the students are allowed to choose their own learning zones.

But experience has shown that it's not enough to simply create clusters and open spaces and then leave it to the pupils or the teachers to do something with them. In some new schools, these become neglected areas where pupils feel they've been left to their own devices. The flexibility that is so greatly cherished can also lead to indifference. In the course of all this anticipated self-organisation on the part of students, it's also important to create welcoming environments and a sense of belonging, and to offer room arrangements that correspond to their intended use.

VARIABILITY IS BETTER THAN FLEXIBILITY.

Some zones are taken over by the students on their own initiative — for example the area underneath the wide staircase of the Danish school A. P. Møller Skolen in Schleswig. Here the students have created a protected cave for chilling out. The school administration has provided lounge furniture and a flat-screen TV that broadcasts Danish programs in Schleswig. At this school, the learning environments are expanding beyond the classrooms — into staircases with seating platforms and the protected areas underneath them, deep window seats with a view, benches atop radiators, niches and retreats whose unobtrusive lighting the students appreciate, high desks along gallery balustrades that offer casual proximity and an overview, etc.

All of these spaces promote independent work. At the Ørestad secondary school in Copenhagen, the “storey decks” in front of the classrooms and specialized rooms, together with the central staircase, offer a variety of spaces for group work, in-depth learning, individual work and relaxation (see page 23). In addition to the laboratories, on the upper storey there is a free-standing lab table that resembles a large kitchen island. Standing around it are students conducting various experiments and learning from one another in the process. The art rooms of the Danish school A. P. Møller Skolen are extended by means of stone tables with water basins in the outdoor area. The schools designed by Arne Jacobsen have always included the outdoors by means of terraces, courtyards and gardens. Today the expansion of the learning environment to include nature is no longer merely motivated by the need for demonstration areas. Multiple perspectives and sensory experiences through light reflections, drafts of fresh air and contact with different natural materials provide additional mental stimulation.

How to shape learning environments

1. Increase the variety of the spaces in order to raise the quality of learning, sharing and the overall experience.
2. Use adaptable furniture that brings flexibility into the learning environment.
3. Use “readable”, i.e. intuitively understandable, room layouts.
4. Design rooms that are compatible with technical support.
5. Offer paths and gathering places outdoors.

The Influence of Design on the Learning Environment

Knoll study at Wake Forest University School of Business

DR. ANJA OSSWALD AND PROF. LUTZ ENGELKE

Business Development and Strategy TRIAD, DIE DENKBANK;
Professor of transformational design, FH Potsdam, founder and shareholder of TRIAD, DIE DENKBANK

➤➤ The new buzzword is “the morphing office”. The single office layout no longer exists; instead, the existing basic space is flexibly adapted to changing requirements. Employees can join up in teams to independently shape their

office environment and adapt it for team discussions, presentations, project work, phases of concentrated work etc. Teams can have varying sizes, and there are smooth transitions between individual work assignments. Offices with this kind of layout enable the efficient use of resources, knowledge and information. At the same time, the spaces are different from one another, stimulating and inspiring. Just like the rooms in an old villa, the spaces on offer should be multifaceted and located close together.

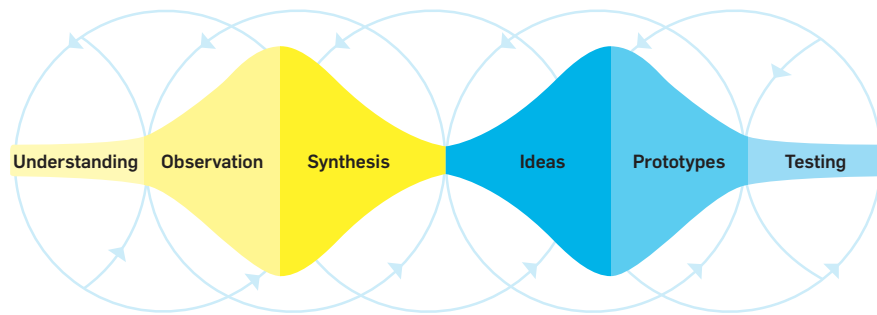
CREATIVE WORKING

RESEARCHING, DISCOVERING, RETHINKING, ABSTRACTING, HACKING, VISUALIZING, TRANSLATING, DOING.

Creativity means work. It's a development activity that can give shape to a fleeting idea. Creativity becomes economically significant if it enables people to earn money. This gives rise to a number of questions. What does creative work look like? What are the steps of the creative process? And what do we mean by "successful creative work"? "Creativity, in the sense of continual rethinking and redesigning, has become an imperative for us," says the cultural sociologist Andreas Reckwitz. It's the basic skill for an idea-based economy and innovation leadership.

So it's no surprise that industrial and service companies are placing their hopes in methods from the repertoire of creative people. One of these methods is design thinking. The related, older method of brainstorming has been used since the 1940s to coax astonishing feats of creativity from office workers without subjecting them to their colleagues' criticism or the consequences of implementation. Today design thinking is leading the creative process to market success. The design specialists at Stanford University in the USA embed idea generation in a process of qualitative investigation that focuses on customer motivations and contexts of use. They expand their angle of vision by adding the perspectives of designers, journalists, advertising strategists and market researchers.

The focus on customers creates a welcome bridge to in-house departments and is meant to make three activities easier: taking a market-relevant perspective, doing interdisciplinary project work, and integrating creative thinkers from outside the company.



THE PROCESS STEPS OF DESIGN THINKING

- 1 **UNDERSTANDING** the problem and finding the faults in previous solutions. Methods: Interviews, social media monitoring, evaluations of media and studies.
- 2 **OBSERVING** the potential users in their overall context. Methods: Shadowing, home visits, videos, social media monitoring, evaluations of behavioural studies.
- 3 **SYNTHESIZING** acquired knowledge into a research hypothesis. Methods: Evaluation, focusing on qualitative requirements, the use context and new findings.
- 4 **GENERATING IDEAS** Creating a pool of ideas that have the desired qualities. Methods: Brainstorming, Walt Disney

method, Six Thinking Hats, Method 635.

5 **PROTOTYPING** Giving the idea a face. Methods: 3D modeling (such as 3D printing or a handmade model), virtual representations, animated films, videos etc.

6 **TEST PHASE** Getting feedback from potential users. Methods: Selecting criteria, creating questionnaires, providing models, conducting interviews, documenting user reactions, filming, recording spontaneous feedback.

Graphics: Adapted with modified colours from Dark Horse GmbH & Co. KG

DESIGN THINKING

This process of problem analysis was developed at Stanford University. It was derived from two processes (an approximation and a solution method) that are used by designers. Christian Beinke and the limited partners at the Dark Horse consulting company studied design thinking at the Hasso Plattner Institute of the University of Potsdam. They have used this process for several years in cooperation with various companies. They have concluded that the sequence of steps is still correct, but in practice the process itself is paramount. Since 2016, Dark Horse has divided the procedure into the steps "Explore", "Create" and "Evaluate" to make it more flexible.

This sounds very promising. But which methods can bring success in which areas? Design thinking may be a good way to develop practical solutions to problems. It can help to close the gaps between departments specializing in design, marketing and sales.

Nonetheless, meetings aimed at developing consensus do not lead to revolutionary innovations. Genuine innovations are ahead of their time. Many an innovation is the brainchild of a nerd who has been doing solitary research for months, inspired by the task of demonstrating potential outcomes or at least making them visible. Can geniuses of this kind do their research and tinkering inside companies? Some companies believe they can, and are therefore setting aside special workdays (to keep the creativity within bounds), establishing dedicated “Creativity Labs” and “Maker Rooms” (to show what is possible) and organising teams of volunteers (to keep the outcomes within the company). If these measures fail to stimulate innovation, the consensus version may be the right route to market success.



Prof. Hans-Jörg Rheinberger

Historian of science, experimental researcher, molecular biologist. Director of the Max Planck Institute for the History of Science in Berlin from 1996 to 2014. He has an honorary doctorate from the ETH Zurich

» I got hooked while doing molecular biology experiments. I was fascinated by the fact that you can think with your hands as well as your head.

HANS-JÖRG RHEINBERGER THE EXPERIMENT AS AN IDEAL

New areas of experimentation are becoming crucial for the physical work environment. Expressions such as “lab”, “clinic” and “prototyping workshop” are already in use. What about the content?

DO YOU NEED SPECIAL SPACES TO DO EXPERIMENTS?

HANS-JÖRG RHEINBERGER Experimentation is a spectrum of methods that range from a secure workbench to an innovation playground. The physical spaces of knowledge workers are always closely related to their area of expertise. As a result, research spaces can come in a variety of forms.

WHAT DO THEY HAVE IN COMMON?

Every experiment has to be understandable as a set of relationships, and it also has to function that way. That's why I use the term “experimental system”. A laboratory is a set of functional relationships between various elements — relationships that are not streamlined or engineered but may be improvised. Routines for using these surfaces, constructions and devices are important, because as we move into unknown territory we don't want to be in any doubt about our supportive environment. We develop routines so that we can fully concentrate on finding out new things in a non-targeted way.

SO THERE'S MORE TO EXPERIMENTATION THAN JUST HAVING AN IDEA AND TESTING IT?

Yes and no. For a long time in the history of science, experiments were regarded not as potentially creative processes but only as tests. From the late 16th century — the era of Galileo — until the late 18th century, experiments were considered demonstrations of what was already known. It was not until the 19th century that laboratories became spaces in which knowledge could

be creatively generated. Actually, an experiment is much more than a test. It's an attempt to approach a subject, and it always generates new questions. You go on a journey of discovery, use exploratory processes and move into new territory.

CAN KNOWLEDGE WORKERS AFFORD TO USE SUCH METHODS WITHIN THEIR WORK ENVIRONMENTS?

It's difficult, not so much because of the financial limits that research is subject to, but because of an economic mindset. The motivation for doing research is more complex than the motivation for solving a problem. If we simply transferred the experimentation process to the work environment, it would lack an object and a goal. That's because objects and goals are generally vague before the experiment begins — and that's the motivation for doing research. The market economy prevents us from thinking in ways that leave the outcome open. The goal of many innovation processes is not to increase knowledge but to reduce the level of uncertainty. In this environment, hardly anyone will push forward to the core of an issue — and that's what experimentation really means.

HOW DO WE DECIDE ON THE RIGHT QUESTION?

Most of all, we need time to approach the issue. During this time a team must bring theory, understanding, creativity and experience to the point where an activity can be productive and lead to results. In most cases, only then can the team ask the right questions, which no one could have thought of before.

CREATIVE PEOPLE DEVELOP THEIR OWN SYSTEMS.

“Experimentation is an activity that moves outward from the known. In spite of all the uncertainty, it doesn’t immediately dissolve into chaos,” says Hans-Jörg Rheinberger, who believes that experimentation is an exploratory process. Creative ideas can generate chaos. Before an experiment begins, we have to define basic principles, a system and a working rhythm, so that the creative spirit doesn’t get carried away by its own ideas.

CARL CONSTANTIN WEBER STRUCTURING CREATIVITY

Creativity is a miracle. Every individual who looks at the world has the potential to be creative, but only a few feel that creativity is their vocation. And even those who feel called must learn how to be creative.



Prof. Carl Constantin Weber

Sculptor. Trained in stone sculpture and bronze casting, studied sculpture in Braunschweig, Bremen and Berlin. Since 2006, a professor in the AFG department of Anhalt University of Applied Sciences, Dessau



For creative work it's extremely important to be able to really dive into a subject. That requires hours of uninterrupted time during which you focus on one thing, calm down and achieve the kind of flow that makes the task proceed more or less automatically.

Photography: Barbara Rohm

TODAY EVERYONE SHOULD BE ALLOWED TO BE CREATIVE. TO WHAT EXTENT IS CREATIVITY INBORN OR LEARNABLE?

CARL CONSTANTIN WEBER: Talent is something you simply have, and initially you have it in an unregulated form. In most cases you do creative things for fun, without feeling you need any discipline. Instead of discipline, you feel an impulse: You want to do it! That's why people who find a profession that matches their inclinations are lucky. But in addition to individual talent, people can do a good job in any profession if they are ready to accept certain structures, learn and practice in order to develop a certain expertise. That requires not only the facilitating force of talent but also a gift for approaching things systematically and analytically.

HOW DO YOU APPROACH A TASK?

If you have creative talent, it's important to study basic principles, learn to systematize, and develop a working rhythm from the very start. When I'm commissioned to create a design — for a competition, for instance — I initially let a long time pass before I do any creative drafting. I first build a model and get to know the context.

SO YOU ASSIMILATE THE CONTEXT?

Exactly! Of course I immediately have an idea, but it tends to be a burden, because I don't yet have the context to evaluate it. So I think to myself, "I hope you don't hold on to this silly idea forever!" And I do some preliminary work: I analyse the relevant history, go to the location, try to find out the situation's requirements. This is a trick to help myself concentrate more intensely. In the beginning, you're intimidated and overwhelmed by the commission, but when you get your thoughts in order and put everything into a system, it calms you down. At that point you've got useful sketches in your notebook and a three-dimensional model in front of you. And at some point you get going and perhaps you find two or three paths that look feasible. And then, all at once, lots of detailed ideas occur to you — but now they are targeted toward the final outcome — and suddenly it all

starts to become a self-supporting system. In a flash, all the pieces fit together. That generates more and more ideas — it's the creative flow! But the preliminary work is necessary in order to make sure this creative flow arises from the right source.

THE FIRST IDEA IS GENERALLY NOT TOO HARD, BUT THE SECOND ONE IS. AND WHAT ABOUT THE FINAL ONE?

That's why I teach my students to create their drafts as though they were building pyramids. While they implement their first idea, they notice that it has generated a second idea, a variation. At that point they tend to follow it up. That's a mistake! They think this second idea will have more substance, they commit themselves to it, and finally they end up stuck in the mud. They should have stopped at a certain point — but in the end everything is a mess! They're frustrated and burned out, because all their good ideas have been spoiled. That's why they should set out all their ideas side by side and develop strands like the ones in a family tree. That too will drive most people crazy, because it opens up so many different paths. But this precisely is creative work: the moment when you believe you've lost control and you have to create a structure in order to maintain control! If you can do that, you win arguments, and when you compare things you know right away what's good. This way the core of your idea is strengthened.

HOW DO YOU GET A "BRILLIANT IDEA"?

One part is intuition. The other part comes to you — not because you're so wonderful, but because you're involved with it and you're open to everything that can contribute to it. You see a process, you find it interesting and you're sensitized. So you begin to observe your surroundings, and you find similar things. This is concentrated and structured work on a single issue, a permanent search for answers. Our task is not to draw on our creativity and make wild judgments — the main thing is to develop criteria for deciding why an idea is good and what it leads to.

THE FLOW MINDSET

Those who have ever experienced it wish for the conditions that will allow it to happen again.

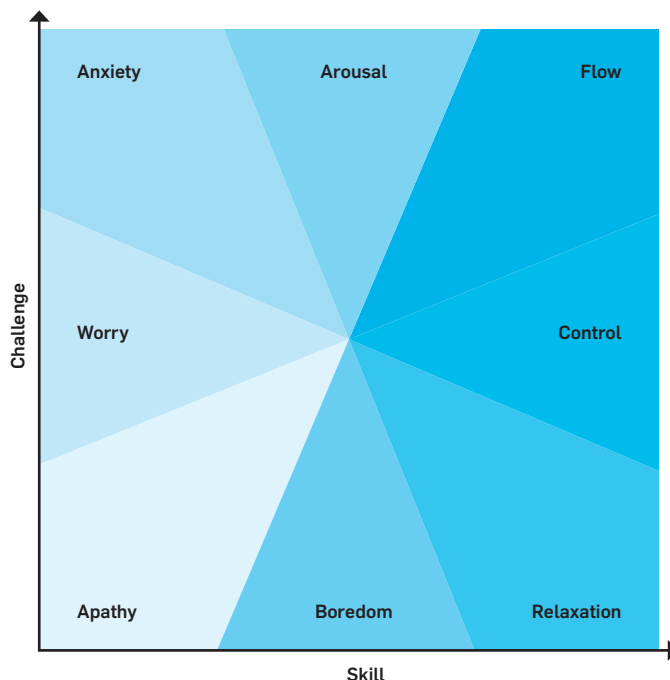
>>> But there's one thing we know for sure about the source of innovation: It can never be induced from outside. The innovative spirit is always intrinsically motivated. New ideas are generated by curiosity, not by strenuous effort. That's why concentration on a task cannot be intensified by rewards that come from outside rather than from the task itself.

Reinhard K. Sprenger
Management consultant

The psychologist Mihály Csíkszentmihályi is known as the discoverer of the “flow” mindset that is familiar to creative people and those who work with a passion. “Flow” refers not to the automatic performance of routine tasks that dull the mind but to a state of intense concentration in which the actor — who is genuinely learning — is completely immersed in the activity at hand and forgets everything around him (time, food, posture, oneself etc.) The flow state is an optimal state of intrinsic motivation. According to Csíkszentmihályi, this feeling is so absorbing because your own abilities are fully engaged in meeting the challenge and they expand as you work on the task. Those who experience the flow situation feel themselves growing intellectually and overcoming their limitations.

CAN THE FLOW MINDSET BE FACILITATED?

The question is whether the intrinsic surrender to the flow mindset can also be stimulated by external factors. From a negative viewpoint, it's certainly important to keep disturbances and interruptions to a minimum during the work phase, which can often last for several hours. In a positive sense, this could almost be called an intimate connection between the individual and his or her thoughts. Because people like to believe what they see, architecture that is experienced as flowing can help to promote the corresponding mental state. One example of that is the reinterpretation of the meandering promenades of ancient Greece and Rome by the architects' firm SANAA at the Rolex Learning Center EPFL in Lausanne, Switzerland.



The flow model
The Flow feeling is located between Arousal and Control. It is the opposite of Apathy, and it refers to a mode of pleasurable work in which one's own abilities and the challenges of the task are in a manageable balance.

THE PARALLEL WORLD OF START-UPS

Innovations are born in garages, ideas find investors, and “unicorns” appear on the stock exchange. In these incubators, fantasies seem to become realities.

It was the rebirth of an old dream: an idea-based economy in the real world. It was realized without any efforts to adapt (except for the business vocabulary), because start-ups want to keep their distance from the old economy in terms of their working methods. They have equipped their work culture with new codes (see page 21), hired cooks and architects (the online service agency Jimdo) and translated team spirit into “family feeling”. Their idea incubators are called not “offices” but “creative labs”. Even established companies are suddenly offering their local employees new features. Airbus now has a prototyping factory building, and Porsche plans a new building that arranges the relevant employees around the central product. The Roland Berger consulting firm has set up a special “playing field” and is now inviting Berlin start-ups and customers to use this co-working environment. Other companies, as well as the real estate sector, are also discovering the constructive nature of these new ways of working.



Dr. Helle Juul

Founder and partner at
JUUL / FROST
ARKITEKTER A/S

➤➤ **Our customers love** the word “co-using”. The term has its origins in the efficiency-boosting strategies used in real estate, but it also implies social motivation. When differently structured zones are used by several people or larger groups of people in the course of a day, that generates a sense of community — or friction. And creating a sense of community is actually the main task of architects when they design learning environments.

Photography:
TERRITORIUM

DTU SKYLAB THE START-UP INCUBATOR

Planning start-up incubators that want to offer flexibility and a differentiated room layout requires an understanding of how to structure spaces. For the DTU Skylab in northern Copenhagen, Helle Juul created connections, initiated movements, provided lines of vision and directed attention.

ATMOSPHERE AS A GOAL

A room is not a container. Architecture provides room for interaction. Space can flow, open up or subdivide and compress. Space helps to determine the number of people that move around in it, and it differentiates between a few, several and many. Space takes into account the time of day and the angle of the sun, and it mediates between indoors and outdoors through heating, lighting and cultural indicators. Space can direct one's gaze and encourage eye contact. It offers orientation and freedom of movement, and it invites people to explore. Space can seem formal or informal, impress people with its grandeur or radiate cosy comfort. Space can indicate to visitors that they are welcome and even properly dressed for the occasion. Space offers comfort zones and always provides users with options. It communicates its functions intuitively and also offers leeway for personal adaptation and development.

URBANITY AS A MODEL

In order to get a sense of future room planning, you have to become familiar with social programming. By

contrast to room functions, it's all about the assignment of social relationships. Social programming takes place in an urban context where various kinds of space are adjacent or overlapping. For example, if you're looking for a quiet place, you can find it under a tree and observe the passing scene from there. Later, when you're in the midst of the flow of traffic, you have a very different sensation of physical closeness and community. The diversity of role assignments through user behaviour is intensified by cultural imprinting. For example, men use public spaces differently than women or children do.

“UMSORGE” AS AN ATTITUDE

When Helle Juul was planning a large school in Carlsberg, Denmark, she realized how important it is to represent community. “I think this generation of students needs a sense of belonging, they need to be recognized. In Denmark we have a word for this: *umsorge*. It is a key for hospitality.” *Umsorge* means “caring”, not only in the sense of orientation or protection but also in the way people interact, learn and work together.



1

OPEN SIGHT LINES — DTU SKYLAB, LYNGBY, DENMARK

1 The innovation centre of the Technical University of Denmark (DTU): In the upper gallery, there are open lines of vision everywhere for the users, who can sit wherever they like.

2 A sticker on the floor saying "This place is yours" greets people at the door. DTU Skylab offers access to all of its parts: factory halls, 3D printing, an auditorium with interesting speakers and diverse work areas on three levels.

Between the defining areas, the Open Space offers flexible space for independent work. During a visit, the atmosphere was one of "relaxed concentration". Wide views of the sky, plantings and the university campus offer varied lines of vision. Vivid colours emphasize architectural zones; the lighting emphasizes the balance between the factory halls and the common room.

Top photo: STAMERS KONTOR



2



Dr. Stefan Rief

*Head of the Competence
Centre Workspace
Innovation
Fraunhofer IAO, Stuttgart*

Stefan Rief believes that the design of workplace and office concepts is a management tool for corporate success. At the IAO, he does research on innovative, productivity-boosting work environments in order to increase the efficiency of knowledge workers. His focus is on environments that comprehensively support networked and flexible work.

Only 60 per cent of productivity is utilised! Today the performance level of employees who do demanding office work is maximally 60 per cent. A great deal of knowledge workers' productivity potential remains unused.

Office 21 Analytics
*Study by Fraunhofer IAO,
2016*

STEFAN RIEF SPACES FOR CREATIVE WORK

The team headed by Stefan Rief at the Fraunhofer Institute for Industrial Engineering (IAO) in Stuttgart is dedicated to increasing the efficiency of knowledge workers. In an interview, Rief explains how the spatial environment can support flexible and creative work.

YOU ASCRIBE MORE INFLUENCE TO THE WORKING ENVIRONMENT THAN WAS PREVIOUSLY REALIZED. HOW CAN A WORK LOCATION ENHANCE CREATIVITY, FOR EXAMPLE?

STEFAN RIEF: The role played by the physical space, including new digital elements, should be rated much more highly than it used to be. Our empirical investigation "Office 21 Analytics", which involved several thousand participants, confirms that frequenting many different locations generates a larger number of good ideas. The study also found that the use of diverse working areas within an office building has a positive impact on the generation of ideas.

WHEN PEOPLE ARE DOING CREATIVE WORK, THEIR THOUGHTS ARE EMBEDDED IN NEW CONTEXTS. COULD THIS TRANSFER BE FACILITATED BY CHANGING PHYSICAL SURROUNDINGS?

It could help. According to the professional literature, creativity involves diverse contexts, varying points of view and different methods for solving problems. Inspiration from a variety of locations, spaces and situations supports the creative process. That's the context in which we must look at corporate think tanks and labs. These are external locations to which companies send their employees so that they can work in new surroundings. The spectrum begins with project areas in co-working facilities and areas that employees choose to work in, together with other free thinkers. Sometimes such an arrangement ends up being an accelerator or an incubator. The aim is not to simply separate these workers from the rest of the company. Instead, the spinoff of a self-organised group helps its members to learn new and more independent working methods, which the returnees then bring back into the company in a transformation process.

DOES THIS MEAN THAT, CONVERSELY, TRANSFORMATION DOESN'T HAPPEN IN TRADITIONAL SPACES BECAUSE THEY ARE ASSOCIATED WITH OLD HIERARCHIES AND RITUALS?

Yes, in many cases our strong identification with the companies we work for stands in the way of the reorientation we need. In order to be open to change, it's important to gain some distance. Being at a physical distance from our old workplace automatically creates a change of perspective. You're outside the company's political network, you work and talk with others, and thus you increase your undirected learning without any pressure.

HOW CAN WE STIMULATE THIS NEW AND CREATIVE ATTITUDE TOWARD WORK?

To give you one example, I think you need a certain incompleteness — a situation where I can take something on and shape it myself. You have to boldly seize ownership of a place, including the visible materials, tools and

resources it provides. You don't have to actively demand these tools and resources. They are already intrinsic to this environment, and you can use them to quickly present or follow up an idea. I believe visualization and physical presentation are essential, especially for groups.

COULD CREATIVE SPACES ALSO ARISE INSIDE A COMPANY?

Yes, but creativity requires lots of space. A red sofa near a table for four does not in itself stimulate creativity. Maybe creative work really needs to take place in other rooms. There's a psychological study which demonstrates that when I pass through a doorway I automatically forget things. I might need a nearby creative space to quickly come up with an idea and then a very different space that is further away for creative group work.

AS YOU PASS THROUGH SEVERAL DOORWAYS, WILL YOU ALSO DEVELOP NEW PERSPECTIVES?

At least there's a possibility that changing your location will also cause a change of perspective. For example, when I go to church I am entering another world and drawing sustenance from it.

THAT'S A STRONG IMAGE. WHY HAVE PEOPLE PAID SO LITTLE ATTENTION SO FAR TO THE WAY OUR PHYSICAL ENVIRONMENT INFLUENCES INSPIRATION AND EMOTION?

Research in the psychology of architecture pretty much dried up in the mid-1990s, but now it's starting up again in the USA. In parallel, people are now using new self-tracking tools in the areas of sports and health to monitor themselves. Many of these tools could also be used individually in the work environment to promote more self-awareness. Where did I have lots of good ideas, and what conditions helped me to be very productive? Identifying these patterns could yield some conclusions about the effects of our work environment. I think this would be a promising idea to pursue in the future.

A BIG LECTURE AND MEETING HALL AT THE IAO HAS A LIGHTED CEILING THAT SIMULATES PASSING CLOUDS. WHAT ARE THE EFFECTS OF SUBCONSCIOUS STIMULI SUCH AS LIGHT AND TEMPERATURE?

There are indications that varying the room temperature — for example, having low temperatures for concentrated work and higher ones for creative processes — works very well. And physical closeness is important in design departments. In Silicon Valley, the degree of physical closeness is extreme, whereas here we're developing in exactly the opposite direction. Of course, in Germany not all of our workers are between 25 and 30 years old. Here we typically work together very intensely for five days, and then everyone goes his or her own way.

THE DIFFUSE PATHS OF AN IDEA

In the beginning it's a vague idea. Then it becomes work. In the end it might be an innovation. This process is facilitated more by learning environments than by innovation management.

➤➤ **The prerequisite for innovation is an attitude** that permeates the culture of daily life: art, literature, sports, schools, kitchens, architecture — not only business operations with their expectation of short-term gains. People who don't hinder innovation are already being innovative. At most, management can improve the framework of possibilities for innovation. It can create a climate that makes innovation more probable. It can't do anything more. But it shouldn't do anything less.

Reinhard K. Sprenger
Management consultant

➤➤ **If we examine evolution** in a search for biological innovations, we come up with egotism, carelessness and sex. And we realize that biological innovation depends on coincidence, wastefulness, selection and propagation. In other words, it depends on originality, high risk tolerance and monitoring success. These qualities are the very opposite of planning, thrift, maintaining the status quo and preserving vested interests.

Hubert Markl
Evolutionary biologist

The generation and evaluation of good ideas is not as simple, controllable and attainable as the concept of “innovation management” implies. For the idea-based economy, self-determined, free and creative work is crucial. That's why we should learn from creative people and their very special modes of operation.

At the “Smashing Ideas” festival sponsored by the weekly newspaper *Die Zeit* in spring 2016, one of the creative participants was 11-year-old Alma Deutscher from the UK. She has composed music since the age of five, plays violin and piano, and at the festival she sang an aria in German from her self-composed opera “Cinderella”. She says her ideas come to her at night — she hears melodies just before she falls asleep or in her dreams. She tries to play these sequences on the piano (recording them on her smartphone). The next day, she fills any gaps by imagining that the melody was written by a brilliant composer whose structures she now has to analyse so that she can continue her composition in his masterful style. Alma devotes hours of concentrated work to this method.

LEARNING ENVIRONMENTS COULD INSPIRE CREATIVE RESEARCH TO COUNTER PRESSURES TO INNOVATE.

Can the three creative phases between an idea and its implementation be embedded in the rulebook of an organisation?

Even the first step of creativity leads in a different direction. Creative ideas seldom arise during concentrated work. Instead, they turn up either before or after — in the car or the shower, when thoughts drift or an overheard word suddenly triggers a chain of associations. The brain must be in a condition of relaxed alertness in order to generate alpha waves — this is the daydreaming mode, in which thoughts are linked in creative ways. If we want to bring this free movement of thoughts into the office, the workday must offer us more space for leisure, relaxation, occasional routines and subconscious distraction.

The second stage, in which an idea is analysed and adapted more precisely, can take place in an open learning environment. Thanks to blended learning, prototyping and simulation-oriented presentation techniques, workspaces and team rooms are diverse and flexible enough to do justice to the nature of the idea and the team members' mode of operation.

The third stage, which is all about implementation and market launch, would probably take place more effectively in a traditional organisation. There the idea is channelled through highly professional departments that adapt it in line with their respective past experiences and market launch standards. However, these departments stand in the way of agile project development and customer orientation. This shortcoming has already been recognized by specialists in organisational development. In the case of IT companies, this realization has led to the establishment of more agile structures. Instead of moving the idea through various departments, individuals from various departments work directly with the idea and its USP (unique selling proposition). In the future, this kind of interdisciplinary teamwork can be encouraged by the blended-learning landscapes that are described in this study. Organisations and companies are realizing that in the idea-based economy all roads actually lead away from the uniform and rigid structures of today — and toward flowing, varied and freely selectable zones for thinking, collaboration and relaxation.

METHODOLOGY & IMPRINT

The third NEW WORK ORDER study was conducted by the trend expert Birgit Gebhardt on behalf of INTERIOR BUSINESS ASSOCIATION (IBA) and ORGATEC, the leading international trade fair for modern working worlds.

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12 QUALITATIVE INDIVIDUAL INTERVIEWS WITH EXPERTS

Rosan Bosch, Designer and Managing Director, Rosan Bosch Studio

Lars Büsing and Julia Dellnitz, Founders of Learnical

Alma E. Deutscher, British composer, pianist and violinist

Dr. Antje Flade, Psychologist of architecture

Dr. Helle Juul, Founder and partner,

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Prof. Christine Kohlert, Managing Director, rbsgroup/Part of Drees & Sommer

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Margret Rasfeld, Co-founder of the initiative "Schools in Transition"

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Dr. Stefan Rief, Head of Competence Center Workspace Innovation, Fraunhofer IAO

Prof. Carl Constantin Weber, Sculptor

Julian Weyer, Partner at C. F. Møller Architects

VISITS AND DISCUSSIONS ON SITE

Jan Bechler, Expert in digital transformation, Hamburg; **Roland Berger**, "Spielfeld", Tobias Rappers,

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at Axel Springer SE with Media Entrepreneurs, THJNK and media impact, April 2016, Berlin; **A. P. Møller Skolen**,

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Executive Creative Director, THJNK ag, Hamburg; **Joana-Marie Stolz**,

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Copenhagen, Lars Viborg Jørgensen, Deputy Head; **Ringstabeck Skole**,

Baerum, Hanne Vislie, Deputy Head; **Schulbau**,

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PHOTOGRAPHY

CREDITS

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