Innovation reinvented
Challenges and solutions for Switzerland’s manufacturing industry
About the study
The study includes the findings of the Deloitte white paper on the Swiss manufacturing industry, which surveyed companies from the Swiss mechanical and electrical engineering and metalworking sectors.

Companies taking part in that survey identified innovation as a key issue for Switzerland’s industrial companies. This study – Innovation reinvented – provides details of interviews with Chief Executive Officers, Chief Innovation Officers, Chief Technology Officers and other experts, which flesh out the quantitative findings.

Between June and September 2013, more than 20 personal interviews were conducted with experts from Avenir Suisse, EPFL (Swiss Federal Institute of Technology Lausanne), ETH (Swiss Federal Institute of Technology Zurich), EMPA (Swiss Federal Laboratories for Materials Science and Technology) and Swissmem and with executives from ABB, Alstom Power, Constellium, Fisba Optik, GF AgieCharmilles, GF Piping Systems, GF Automotive, Meyer-Burger, Starrag and 3a Composites.
Dear reader

Over the past few years, the pressure on the Swiss manufacturing industry to innovate has intensified markedly and, with it, pressure on Switzerland and its industrial sector as flagships for innovation. Companies perceive challenges from three main trends:

1. **More rapid innovation processes** among competitors, who are overtaking Swiss companies and forcing them to be reactive rather than proactive.

2. Greater **internationalisation of research and development (R&D)**, triggered in some cases by relocating production abroad.

3. A changed perception of **innovation as more than just traditional product innovation**.

How can Swiss industrial companies respond to these challenges? Our analysis points to three key findings:

- The pace of innovation is accelerating all the time, and not all companies can sustain that pace; many global competitors are now bringing their innovations to market more rapidly than Swiss industrial companies. If Swiss businesses are to remain competitive, they need a different approach to managing innovation. It is important that pressure to innovate originates with company leadership, that the innovation process is clearly organised, that market and commercial experience is tapped, and that companies have the courage to take risks and see through innovation.

- The internationalisation of R&D is an established phenomenon and has gathered pace as production is increasingly relocated and new growth markets are tapped. The greatest challenge is to manage global R&D teams efficiently. Regular exchange and sharing between R&D teams is the key to successfully internationalising R&D, while building trust between individual teams is essential for world-class performance.

- Swiss industrial companies are well placed to make incremental changes centred on creating added value for their customers. Since the quality of existing products cannot, in many cases, be further improved, the focus here is on the functionality of new products. Yet Swiss companies are not doing all they can to drive forward innovation beyond traditional product innovation, including innovative solutions in the maintenance and service sector, greater customer involvement, process innovation, and development cooperation, including ‘open innovation’.

This study – *Innovation reinvented* – offers answers to the following questions:

- **Efficiency in R&D**: How can I manage innovation cycles that are becoming shorter and shorter? How can I boost the speed of innovation and the return on investment in innovation?

- **Customer value**: How do I acquire knowledge about future customer requirements – or create those requirements? What innovations can I produce within my existing resources?

- **Financing**: Which models of innovation financing should I choose? How are decisions made about allocating available R&D funding?

- **Organisation and resources**: How can I make the process of managing R&D less complex? How can I set up integrated innovation management?

- **Staffing**: How do I find, motivate and retain the best R&D staff? How can I ensure knowledge transfer between generations and between regions?

- **Internationalisation**: How do I internationalise R&D or increase its international reach? How do I motivate a global R&D team to work together successfully?
• **Competitors**: How can I maintain my company’s innovative edge over competitors? How do I assess the prospects for market success?

• **Bureaucracy**: How do I manage the increasingly complex regulatory and licensing system in the area of R&D?

We would like to thank the management of the companies taking part in the expert interviews for their invaluable responses to these questions.

We have developed three approaches to successful management of the trends in innovation and the future challenges outlined in this report: **efficient management of innovation; global operational models for R&D; and using the ‘ten types of innovation’ model.**

We hope you enjoy reading the study and find its insights are interesting and stimulate discussion.

Dr. Ralf C. Schlaepfer
Managing Partner, Strategic Growth
Manufacturing Industry Leader
Deloitte Consulting AG

Markus Koch
Partner Consulting
Deloitte Consulting AG
Switzerland comes under pressure on innovation

The challenge for the manufacturing industry
Over recent years, the pressure on Switzerland’s manufacturing industry to compete globally has increased markedly.

While currency issues have played a significant role, the main reason has been greater pressure to innovate. 50% of companies taking part in the Deloitte manufacturing industry survey said that they were concerned about technological improvements in their competitors’ products, which were hampering their ability to compete.

At first glance, these comments are surprising. Annual rankings by the World Economic Forum (WEF) and the World Intellectual Property Organization (WIPO) confirm that Swiss companies are highly competitive and are flagships for innovation. In terms of competition and innovation, in fact, Switzerland enjoys a substantial lead both over other industrialised nations and the rapidly developing emerging markets (Chart 1).

The expert interviews Deloitte conducted suggest, however, that these global rankings of Switzerland’s competitiveness and ability to innovate do not necessarily reflect the full picture.

The interviewees stressed that Switzerland’s attractiveness as a centre of innovation is based on its ‘dual’ vocational training system, which combines on-the-job training with academic input, and outstanding training institutions in ETH (Swiss Federal Institute of Technology Zurich) and its counterpart in the French-speaking cantons, EPFL (Swiss Federal Institute of Technology Lausanne). Switzerland also boasts a high-performing and competitive manufacturing industry, one of the key requirements for innovation, and has an innovation-friendly and secure investment environment. More general factors, such as the country’s political stability, good infrastructure and robust business environment, also boost Switzerland’s attractiveness and bolster its reputation as a centre for innovation.

Chart 1. WEF Global Competitiveness Report vs. WIPO Global Innovation Index
(Score, 2013)

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However, many interviewees are critical of the fact that these rankings represent just a snapshot of data from the past and that much of the data is ‘soft data’ that fails to take account of the implementation and market launch of innovations. They also argue that the rankings are dominated by factors that do not easily lend themselves to comparison and have little to do with innovation, such as patent applications.

The interviewees are also unanimous in their view that other countries are rapidly gaining ground on the Swiss innovation flagship, in particular in the areas of R&D investment and talent. And as a high-cost country, Switzerland is at a clear cost disadvantage in the research sector.

Many of our interviewees agree on the most serious deficits – and the most significant areas for improvement – in Switzerland as a centre for innovation: human capital, collaboration between universities and industry, and implementation of innovation.

What emerges is, in fact, a very similar picture to the one reflected likewise in the leading global innovation rankings, including Bloomberg as well as the WIPO and WEF rankings mentioned above. Detailed scrutiny of these rankings shows that the three areas listed above are precisely the areas in which Switzerland’s performance has either stagnated or declined over the last few years (see Chart 2).

In terms of human capital, most interviewees report a major problem in finding or training the right R&D staff. They are critical of the fact that many universities produce excessive numbers of ‘pure’ scholars when industry actually needs graduates with solid practical experience.

Most interviewees stress that collaboration between universities and industry could be organised more professionally, citing the United States as the best example of how this could be done. Industry representatives complain that the research conducted in universities often bears little relevance to practice and largely ignores business efficiency. Industry, by contrast, is often excessively preoccupied with budgets and costs in the interviewees’ view.

In the area of implementing innovation and bringing it to market, the interviewees agree that the most significant barrier is the Swiss mentality, specifically its risk-averse nature.
Differences between companies and sectors

The Deloitte manufacturing industry survey shows that 79% of companies believe the focus on innovation and technology is a key component of their corporate strategy.

This finding is in line with the global trend for multinational industrial companies in particular to stake their reputation on their commitment to innovation.

This commitment is more than mere lip service: each year, Swiss industrial companies spend significant amounts on R&D in sectors including mechanical engineering, electronics/electrical engineering, precision instruments, automotive suppliers, industrial applications, and chemicals.

On average, leading manufacturing companies in Switzerland spent over 5.0% of revenue on R&D in 2012, slightly more than the five-year average of 4.6% (see Chart 3).

Chart 3. Top innovating companies in the Swiss industrial sector

<table>
<thead>
<tr>
<th>Company</th>
<th>R&amp;D Expenditure 2012 (CHF millions)</th>
<th>R&amp;D Expenditure in % of revenue 2012</th>
<th>R&amp;D Expenditure in % of revenue (5-year average)</th>
<th>Trend</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABB Ltd.</td>
<td>1,373</td>
<td>3.7%</td>
<td>3.4%</td>
<td></td>
</tr>
<tr>
<td>Syngenta AG</td>
<td>1,175</td>
<td>8.8%</td>
<td>8.8%</td>
<td></td>
</tr>
<tr>
<td>Liebherr International</td>
<td>586</td>
<td>5.3%</td>
<td>5.2%*</td>
<td></td>
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<tr>
<td>Givaudan AG</td>
<td>404</td>
<td>9.5%</td>
<td>9.0%</td>
<td></td>
</tr>
<tr>
<td>Firmenich International</td>
<td>264</td>
<td>10.0%</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Clariant AG</td>
<td>175</td>
<td>2.9%</td>
<td>2.4%</td>
<td></td>
</tr>
<tr>
<td>Sika AG</td>
<td>173</td>
<td>3.6%</td>
<td>2.5%</td>
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<tr>
<td>Endress+Hauser AG Int.</td>
<td>137</td>
<td>6.7%</td>
<td>7.4%</td>
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<tr>
<td>RUAG Holding AG</td>
<td>134</td>
<td>7.7%</td>
<td>8.4%</td>
<td></td>
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<tr>
<td>Lonza Group AG</td>
<td>116</td>
<td>3.0%</td>
<td>3.5%</td>
<td></td>
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<tr>
<td>Schindler Holding AG</td>
<td>115</td>
<td>1.4%</td>
<td>1.2%</td>
<td></td>
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<tr>
<td>Sonova Holding</td>
<td>114</td>
<td>6.3%</td>
<td>6.4%</td>
<td></td>
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<tr>
<td>Mettler-Toledo</td>
<td>106</td>
<td>4.8%</td>
<td>5.0%</td>
<td></td>
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<tr>
<td>OC Oerlikon Corporation AG</td>
<td>106</td>
<td>3.6%</td>
<td>5.6%</td>
<td></td>
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<tr>
<td>Bühler Holding AG</td>
<td>104</td>
<td>4.3%</td>
<td>4.3%</td>
<td></td>
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<tr>
<td>Georg Fischer AG</td>
<td>93</td>
<td>2.6%</td>
<td>3.0%</td>
<td></td>
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<tr>
<td>Meyer-Burger</td>
<td>92</td>
<td>14.3%</td>
<td>6.7%</td>
<td></td>
</tr>
<tr>
<td>Sulzer AG</td>
<td>89</td>
<td>2.2%</td>
<td>1.9%</td>
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<tr>
<td>Bucher Industries AG</td>
<td>81</td>
<td>3.1%</td>
<td>3.2%</td>
<td></td>
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<tr>
<td>Bobst</td>
<td>70</td>
<td>5.5%</td>
<td>5.8%</td>
<td></td>
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<tr>
<td>Autoneum</td>
<td>66</td>
<td>3.5%</td>
<td>3.6%*</td>
<td></td>
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<tr>
<td>Gebert AG</td>
<td>50</td>
<td>2.3%</td>
<td>2.3%</td>
<td></td>
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<tr>
<td>Rieter Holding</td>
<td>43</td>
<td>4.8%</td>
<td>4.1%*</td>
<td></td>
</tr>
<tr>
<td>Ems-Chemie Holding AG</td>
<td>36</td>
<td>2.0%</td>
<td>2.6%</td>
<td></td>
</tr>
<tr>
<td>Starrag Group</td>
<td>29</td>
<td>7.6%</td>
<td>7.7%</td>
<td></td>
</tr>
<tr>
<td>Huber+Suhner</td>
<td>28</td>
<td>4.0%</td>
<td>3.7%</td>
<td></td>
</tr>
<tr>
<td>Forbo</td>
<td>16</td>
<td>1.4%</td>
<td>1.4%</td>
<td></td>
</tr>
<tr>
<td>Average</td>
<td></td>
<td>5.0%</td>
<td>4.6%</td>
<td></td>
</tr>
</tbody>
</table>

Notes: * 3-year average. The ranking includes all companies from the mechanical engineering, electrical engineering/electronics, precision instruments, automotive suppliers, industrial applications and chemicals sectors listed in the Handelszeitung Top 500 index.

The ranking is determined by R&D expenditure in 2012.

Very large manufacturing companies generally invest heavily in R&D. Small and medium-sized companies (SMEs) do not have the budget to do so and cannot afford to invest on the same scale in R&D, innovation management, intellectual property (IP) management and marketing, although they may be investing the same proportion of their revenue in innovation.
The precision instrument and chemicals sectors head the league table for R&D expenditure, with precision instrument manufacturers spending more than 6.4% of their revenue on R&D in 2012. R&D expenditure by chemicals companies is also proportionally high at an average of 4.2% when the chemicals and pharmaceuticals manufacturer Syngenta is excluded.

The mechanical engineering and electronics/electrical engineering sectors, by contrast, invest just over 3% of revenue in R&D. The lowest proportions are to be found in the industrial applications and metal production and processing sectors, which spend 1.7% and 0.2% respectively of their revenue on R&D.

These figures tally broadly with international benchmarks comparing R&D intensity (R&D expenditure as a percentage of revenue) across sectors: in the global general industrials sector (mechanical engineering), R&D intensity is 2.7%; in the industrial engineering sector, it is 3.1%; in the chemicals sector, it is also 3.1%; in the automotive sector, it is 4.2%; and in the electronics and electronic equipment sector, including precision instruments, it is 5.1%.

However, the highest R&D intensity figures, both in Switzerland and globally, are achieved not by the traditional manufacturing industry but by the pharmaceuticals and biotechnology industry, with an intensity of between 12% and 18%, and the information technology sector, with an intensity of between 8% and 12%.

This means that SMEs are more dependent on stronger support and cooperation in the innovation sector than the largest companies.

Alongside company size, there are also marked differences in R&D expenditure in different sectors (see Chart 4).

**Chart 4. Growth rates and R&D expenditure as a percentage of revenue in leading Swiss industrial companies**

[2012, CAGR 2007-12]

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“We need more priority programmes, vertical networks and boldness in terms of open innovation to step up the pace of technology transfer from the research and development stage to commercial implementation and to boost Switzerland as a centre for innovation.”
Prof. Dr. Gian-Luca Bona, EMPA, Director

“Cooperation between universities and industry in the area of innovation is successful when it is put on a practice-relevant footing and shown from the outset to be cost-effective.”
Silvère Leu, Meyer-Burger, Chief Innovation Officer

“Universities could certainly work harder at forward integration and at developing their outstanding, but sometimes early-stage, technology from the basic research stage, to make it more attractive to the market and to industry.”
Dr. Silvio Bonaccio, Head of ETH transfer

**Measures to boost Switzerland as a centre of innovation**

**Support**

- Putting in place more (state) incentives
- Providing greater support for research to give industry an edge over its competitors, along the lines of the ‘early stage’ scheme run by the Swiss National Science Foundation (SNSF) and the ‘later stage’ scheme run by the Commission for Technology and Innovation (CTI)
- Setting up priority programmes for individual sectors that facilitate a better transfer of technology at a level below that of state control or formal industrial policy
- Identifying and making more risk capital available

**Mind-set**

- Encouraging company management teams and R&D staff to be more willing to take risks
- Stepping up the emphasis on implementation
- Boosting the speed of innovation across the board
- Driving forward corporate channelling of research budgets to universities
- Ensuring greater diversity in R&D teams and/or making them more international, to make the most of being able to draw on diverse cultural mind-sets

**Cooperation**

- Setting up more vertical networks between individual (non-competing) companies
- Ensuring more cross-company ‘open innovation’
- Ensuring greater professional collaboration between universities and industry and developing contact points for companies within universities
- Publicising the role of ‘Fachhochschulen’ (institutions providing technical education at tertiary level) in providing basic research to companies as an alternative to universities

**Training**

- Boosting the ‘dual’ vocational training system further
- Facilitating further training and qualifications in technical fields and the natural sciences
- Providing more practice-based training within universities
- Positioning Switzerland as the leader in the training field, producing a ‘self-propelling’ effect on innovation

**Framework**

- Aiming to reduce regulation
- Calling for greater flexibility within the tax system, for example by providing tax relief on innovation activity or creating scope for R&D to be tax-deductible
- Maintaining Switzerland’s attractiveness to top executives from abroad
- Preserving Switzerland’s general openness
Current trends and challenges in innovation

Analysis of the manufacturing industry survey findings and our interviews with experts have identified three trends in innovation that are currently posing a major challenge to industrial companies in Switzerland: more rapid innovation processes, the internationalisation of R&D, and innovation that goes beyond product innovation.

More rapid innovation processes
54% of respondents in the Deloitte manufacturing industry survey say they would like to use greater investment and new products as tools for growth.

Using innovation to secure growth represents a major challenge, given that innovation processes have become significantly more rapid across the world.

Speed of innovation is not necessarily one of Switzerland’s strengths. In fact, innovation processes and ‘time-to-market’ periods for new products are lengthier in Switzerland than in other countries, according to many interviewees (see schematic diagram in Chart 5).

“Switzerland is well positioned in the area of creative output, but effective implementation of innovations and their market launch is often the weak link. This is in no small part a function of the Swiss mentality, which is characterised by a high degree of risk averseness.”
Prof. Dr. Gian-Luca Bona, EMPA, Director

“The more rapid pace of innovation is tangible. In Switzerland, it can take up to five years to develop, produce and launch a machine. In Asia, it takes a maximum of two years.”
Prof. Dr. Frank Brinken, Starrag, President & CEO

Notes: The chart is for illustrative purposes only and is not based on actual data. It only shows a time lag of the cash flow and does not make any statement about level of costs in Switzerland and abroad.

While Swiss industrial companies are good at identifying new ideas – the creative part of innovation processes – they are often weak in terms of innovation itself, that is actual product development. Our interviewees believe there is also room for improvement in market launch and in commercialisation, where high levels of discipline are needed as well as creativity. Several interviewees alluded to companies’ unwillingness to take greater risks.
Many global competitors of Swiss industrial companies get their innovations to market more rapidly than Swiss companies. In some cases, development times in Asia are just half of those in Switzerland, for example. The relative slowness of Swiss companies to innovate means higher quality, but products may be out of date by the time they arrive on the market.

For many Swiss industrial companies, therefore, the question is how they can manage the innovation process more efficiently. The key questions are: How do I select from the plethora of ideas available? How can I maintain my creativity? How do I boost discipline and drive innovation more efficiently without sacrificing quality? How can I reduce 'time-to-market' across the board? And how can I speed up market launch and commercialisation?

The interviewees cited a number of tried and tested practices that have been found to be effective in managing innovation efficiently and successfully. They are: a leadership style that makes innovation a major focus; clear organisation of cross-functional innovation processes; an open style of working that facilitates flexibility and freedom; acquisition of knowledge about technologies, customers, markets and partners; greater cooperation, both within and outside the organisation; and involvement of the entire workforce, together with measures to boost their motivation by means of intangible values.

### Best practices of managing innovation processes efficiently and successfully

| Leadership style | • Pressure to innovate must come from the company’s leadership  
• Innovation strategies will be of use only if executives have the courage to apply them consistently |
|------------------|---------------------------------------------------------------|
| Organisation     | • Creating a clear foundation for innovation management  
• Putting in place strategic planning (identifying customer and market needs and adapting the company’s innovation portfolio to its strategy)  
• Defining a clear innovation process (a programme involving reporting on all current projects)  
• Designing the information process to be cross-functional, involving sales and marketing from the development stage to speed up market launch and commercialisation  
• Defining clear roles  
• Defining clear key performance indicators (KPIs) that, for example, are geared to the development cycle so that projects can be completed in a timely and customer-oriented way  
• Ensuring the flow of information (in particular, ensuring that the flow of information is as direct as possible)  
• Building in more time for planning ('proof of concept', making the right developments, etc.) |
| Style of working | • Allowing flexibility and freedom  
• Encouraging and facilitating early experimentation |

"Swiss industrial companies tend to sit on their innovations for too long and aren’t bringing them to the international market quickly enough.”
Georg Reif, 3A Composites, CTO

"The pressure to innovate must come from the very top. Organisations with top managers who are themselves innovative and willing to take risks have an advantage here.”
Dr. Nanja Strecker, Constellium, General Manager Innovation Cells

"Innovation processes take longer in Switzerland than in other countries. This lack of speed means higher quality, but it often also means that industry is slow to assess the marketability of new products or that products are out of date virtually before they come off the production line.”
Prof. Dr. Frank Brinken, Starrag, President & CEO
“Companies invest a lot in people. It’s expensive to develop R&D staff, so companies don’t want to lose them.”
Frederic Vexo, Alstom Power, Communities & Globalisation Manager

“It is generally the case in production that two people can produce more than just one. The reverse is true in research: a single outstanding researcher usually achieves more than two average researchers.”
Dr. Willi Paul, ABB Switzerland, Senior Vice President and Head of Corporate Research

“Employees have an absolutely key role to play. Innovation starts with good people and good training.”
Dr. Daniel Chartouni, ABB Switzerland, Corporate Research, Head of Energy and Materials Department

### Best practices of managing innovation processes efficiently and successfully (continued)

| Knowledge | • Selecting the right (new) product(s) and the right process (market and technology ‘scouting’)  
| • Exploiting commercial experience (knowledge of how markets are developing in terms of trends, risk, etc.)  
| • Understanding customers and partners in the value chain |
| Support and cooperations | • Organising regular new idea workshops  
| • Creating research communities that operate beyond department and division boundaries (synergies)  
| • Making use of networks and cooperation arrangements with experts, both internally and externally  
| • Making use of external research advisory boards  
| • Transforming central research into open innovation management |
| Workforce and motivation | • Recruiting the right R&D staff in terms of experience, training, mentality, etc.  
| • Involving all employees, not just R&D staff, in innovation management, since production workers can also come up with innovative solutions  
| • Facilitating attractive career planning to provide a career path from researcher to lead researcher and not just from researcher to manager or administrator  
| • Promoting recognition and instituting innovation awards (intangible values are often more meaningful than material or monetary reward)  
| • Boosting the visibility of researchers in the company  
| • Facilitating customer contacts for R&D staff  
| • Setting up a fair IP strategy and motivational programmes |
Quick checklist: Has your company answered the following questions in relation to more rapid innovation processes?

- How can I pick out promising ideas from among all those available?
- How can I deal with innovation cycles that are becoming shorter and shorter?
- How can I improve the speed of innovation?
- What do I need to do to contain product diversity within a pre-determined range?
- How can the success rate of investment in innovation be kept above 50%?
- How can development lead times be reduced across the board?
- How can new technologies applications be used to boost the speed of developments?
- How can the timing of innovation be improved, that is the start and end points?
- Which models of innovation funding should I choose – internal, external, start-up, etc.?
- How does the company’s management make decisions about allocating available R&D funding?
- What resources do I have internally and what can I outsource?
- How can I ensure that innovations are properly marketed?
- How can our vision of innovation be positioned so that it inspires future innovation?
- How can I reduce the increasing complexity involved in managing R&D?
- How can I instigate a holistic approach to management innovation, for example integrating production plants, orienting processes to customers, etc.?
- How can I make my R&D staff more diverse (young people, women, etc.)?
- How can I create space for creativity in the midst of hectic day-to-day operations?
- How do we assess the prospects for success on the market?
- How do I tackle the increasingly complex system of regulation and licensing in the R&D sector at both national and global level?

“There’s no ‘one size fits all’ solution to ensure successful innovation. Often, you simply have to be pragmatic and sometimes, chance plays a large part. But you’re much more likely to be successful if you network widely, cooperate, and then follow ideas through consistently.”

Prof. Dr. Gian-Luca Bona, EMPA, Director

“There are always more ideas than can realistically be developed and implemented. It’s much harder to pick the right idea than to come up with ideas in the first place.”

Dr. Willi Paul, ABB Switzerland, Senior Vice President and Head of Corporate Research

“Implementing innovation is seen very much as a question of budgets here in Switzerland. And that doesn’t allow for failure.”

Prof. Dr. Frank Brinken, Starrag, President & CEO
Internationalisation of R&D

Swiss industrial companies are increasingly relocating their production operations as part of their efforts to internationalise, and this is having a major influence on innovation.

90% of respondents in the Deloitte manufacturing industry survey indicated that they expect all sectors of Swiss industry to be producing more outside Switzerland, particularly in new growth markets. This goes hand in hand with relocating R&D, and 55% of those taking part in the survey believe that R&D capacity outside Switzerland will also increase in future.

The mechanical engineering, electronics/electrical engineering and precision instrument industries are in line with the global internationalisation trend, led over the past few years by the pharmaceuticals industry. R&D expenditure abroad rose by just 14% between 2000 and 2004 but then soared by 320% between 2004 and 2008, albeit from a very low base. By contrast, the pharmaceuticals industry increased its expenditure by a consistent 50% or more over the same four-year periods and is likely to do so over the next four years (see Chart 6).

“It’s not necessarily a disadvantage that Switzerland’s R&D expenditure as a proportion of revenue at home is growing less rapidly than its spend outside the country.”
Dr. Rudolf Walser, Avenir Suisse, Senior Consultant

“You cannot completely decouple the market, production and development.”
Georg Reif, 3A Composites, CTO

For the period 2008 to 2012, R&D expenditure in the mechanical engineering, electronics/electrical engineering and precision instruments sectors is expected to rise by 88% as against 46% in the pharmaceuticals sector.

Internationalisation is having a different impact on each of the various elements of R&D: basic research, technology development, product development and ‘product engineering’.

In the view of most Swiss industrial companies, basic research – or basic development – is generally location-independent and can be carried out not only in Switzerland itself but also in other research centres or at elite universities outside the country.
Technology development is often carried out centrally. There is a trend towards retaining high-end research of this kind within Switzerland and developing it, with protection of intellectual property (IP) often the driving factor.

Product development, by contrast, is usually carried out in the location where production is sited. If production is relocated to new growth markets or developed there, this often goes hand in hand with product development: new local products are developed in local markets using input and know-how from local R&D staff.

‘Product engineering’ – that is, small scale product improvements is normally a production-support function.

There is no strict geographical compartmentalisation between R&D and production. At a time when value chains are international in nature, R&D also forms part of a global system, and virtually all our interviewees confirm the trend for keeping R&D and production together.

Companies cite many different reasons for relocating their R&D to new production plants outside Switzerland. While lower costs may well be a reason (product development is, for example, less expensive in India than in Switzerland), companies are likely to attach greater importance to the advantages of having their R&D activity co-located with production: local adaptations to the manufacturing process can better reflect local markets making it easier to spot mistakes at an early stage, while there are also advantages to increasing the sharing of know-how with local developers.

For many Swiss industrial companies internationalising their R&D, the issue is how they can organise their global R&D teams holistically. The following questions are often at the heart of their decision: Where should we be carrying out our basic research, and where should technology development be happening? And what about product development? How can technology development teams work successfully with product development teams? And how can Swiss-based product development teams work successfully with product development teams based outside Switzerland?

The interviewees list the following practices as tried and tested solutions for successfully relocating R&D and developing global R&D teams: creating a shared culture and shared communications structures; setting up a clear structure and organisation for activities; regular and intensive exchange, so that team members learn to trust one another; and different tools for motivating R&D teams in Switzerland and those outside the country.

### Best practices for successfully relocating R&D and developing global R&D teams

**Culture**
- Introducing a shared language (English)
- Bridging cultural differences
- Working towards a shared project vision for R&D teams (onshore and offshore)

“Companies must show that they have a presence both in Switzerland and in other countries to serve as the basis for competing successfully in the innovation stakes.”

Dr. Rudolf Walser, Avenir Suisse, Senior Consultant

“You can separate production and R&D geographically if you mass-produce your products. That doesn’t work so well for individualised production solutions, though.”

Prof. Dr. Frank Brinken, Starrag, President & CEO
“Having a common language and a shared IT system is a key success factor if your R&D and production sites are going to be geographically separate.”
Frederic Vexo, Alstom Power, Communities & Globalisation Manager

“Needed to keep the team together is a common language and a shared IT system.”
Peter Nieder, Nuine, Corporate Development

Best practices for successfully relocating R&D and developing global R&D teams (continued)

| Structure | • Setting up mixed (onshore and offshore) R&D teams  
| | • Networking projects  
| | • Providing a shared IT system  
| | • Developing an effective communications infrastructure, including video conferences, broadband networks, large screens for online conferences, etc.  
| | • Ensuring the flow of information and creating a shared information pool  
| | • Setting up central competence centres for processes, guidelines and evaluation  
| | • Having local product developers reporting within global units as well as locally  

| Activities | • Creating a balanced relationship between onshore and offshore activities  
| | • Creating a balanced relationship between core activity and intermittent activity (retaining a basic level in offshore locations)  

| Exchange | • Ensuring regular exchange between R&D staff in Switzerland and in foreign locations, such as virtual meetings, face-to-face meetings and project visits. Trust will be built only where R&D teams meet and get to know each other and are able to share views and experiences  
| | • Bringing together developers from Switzerland and those in new locations  
| | • Sending product managers from Switzerland to new markets, so that they can get to know them and understand how they operate  

| Motivation | • Tackling differences between offshore locations, not only through remuneration but also – and particularly – through an interesting workload and project visits  
| | • Motivating Swiss R&D staff to carry out short-term visits to new locations; this builds trust, ensures quality, etc.  

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Quick checklist: Has your company answered the following questions in relation to the internationalisation of R&D?

- How can I internationalise R&D against the backdrop of tapping into new growth markets?
- Which global operating model for R&D should I choose?
- How do I motivate a global R&D team to cooperate successfully?
- How can I ensure a smooth flow of information in global R&D teams?
- How can I set up integrated communications?
- How do I successfully integrate production plants?
- How do I get to know about future customer needs in new markets if the R&D/production cycle is no longer based locally, in Switzerland?
- How can I recruit the right R&D staff and attract talent, both in new markets and in Switzerland?
- How can I motivate R&D staff in new markets but also in Switzerland (which may be more difficult than in the new markets)?
- How do I manage the turnover of R&D staff in new markets?
- How can I avoid concentrating know-how in just a few individuals?
- How can I ensure future knowledge transfer between generations and between regions?

“A willingness to fail is part of successful innovation management.”
Udo Kreutzarek, GF Automotive, Head of Innovation Management

“Research in Switzerland’s industrial sector is still largely dominated by middle-aged males.”
Marcel Vorburger, GF AgieCharmilles, Head of Strategic Planning

“One of the key challenges for innovation over the next few years will be intergenerational and geographic knowledge transfer.”
Frederic Vexo, Alstom Power, Communities & Globalisation Manager
Customer-oriented innovation

65% of survey participants identify adapting their products to local customer needs as their key strategy in new growth markets.

“One of Switzerland’s strengths is its emphasis on being very close to the customers, listening to them and observing them.”
Dr. Nanja Strecker, Constellium, General Manager Innovation Cells

“Innovation doesn’t always have to be rocket science. What’s more important is how we can create added value for the customer that meets his needs better.”
Dr. Nabil El Barbari, GF Piping Systems, VP / Head of Technology, Quality and Sustainability

Innovation is more than product innovation

65% of companies taking part in the Deloitte manufacturing industry survey identified adapting products to customers’ needs as a central strategy for growth.

Innovation that is strongly geared to customers’ needs is vital to remaining competitive. Globally, there has been a growing trend over recent years for innovation that goes beyond mere traditional product innovation. Global industrial companies are already exploiting this potential to differentiate themselves from their competitors and to gain a competitive edge.

The factors giving rise to unused potential for innovation can be divided into operational factors and strategic factors. Measures that are important for a company wishing to compete in a market today (‘the need to compete’) can be transformed into a differentiating factor that confers a competitive advantage (‘the need to differentiate’) and vice versa (see Chart 7).

Companies gear their innovation policy to their ability to bear risk. Incremental innovation sits well with the mentality of Swiss companies.”
Dr. Rudolf Walser, Avenir Suisse, Senior Consultant

Innovative solutions in the services business area offer wide scope for differentiation that enables companies to boost their global competitiveness. The old model of commissioning, maintaining and servicing is increasingly giving way to services with specific industry solutions and additional services.

There is also unused potential for innovation in further developing local product variants that have cheaper development processes, use leaner production processes and create new products that are attractive to customers in both emerging and developed markets (‘frugal innovations’).

Process innovations that further optimise existing operations and produce goods more cheaply are also becoming increasingly important.

In future, creating a comprehensive innovation culture that straddles all the commercial areas within a company will be central to successful innovation.
Targeted management of product life cycles is becoming more important. Improved product launch lead times, consistent integration, and greater efficiency in development and sales are just some of the competitive advantages it can bring.

Swiss industrial companies as a whole still regard innovation mainly as ‘product innovation’. Their strengths lie predominantly in making incremental improvements to products, in most cases emphasising functionality because it is often impossible to improve product quality any further. Creating added value for the customer is the main focus of such incremental improvements.

Some Swiss companies are, however, making innovations that go beyond traditional product innovation. These include new applications in the maintenance and service sector and development cooperation arrangements, up to and including ‘open innovation’.

The issue for many Swiss industrial companies is what unused potential for innovation should they tap into in the future. The following questions are central here: Which product innovations will enable me to continue to be successful? What new functionality is in demand? Which process innovations will give me a competitive edge? And what are the further corporate areas in which I can innovate (for example, profit model and distribution channel)?

The interviewees identified the following examples of unused potential for innovation: more, and better, product functionality; greater orientation towards customer and market requirements; forward-looking and intelligent services, for example in the servicing area; networking of machinery and processes; and cooperation with all partners in the value chain.

<table>
<thead>
<tr>
<th>Current examples of unused potential for innovation</th>
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<tbody>
<tr>
<td><strong>Product focus</strong></td>
</tr>
<tr>
<td>• Placing a greater focus on functionality rather than quality (because quality is already very high and cannot be enhanced further)</td>
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<tr>
<td>• Aiming for better functionality at a better price</td>
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<tr>
<td>• Further developing multi-functionality</td>
</tr>
<tr>
<td>• Driving forward the man/machine interface (sometimes referred to as a process of “iPhone-ification”)</td>
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<tr>
<td>• Integrating digital product memory</td>
</tr>
<tr>
<td>• Developing smaller and better products that can be produced more rapidly</td>
</tr>
<tr>
<td>• Boosting miniaturisation</td>
</tr>
<tr>
<td>• Continuing to aim for energy efficiency</td>
</tr>
<tr>
<td>• Using fewer materials or using more optimal materials (such as higher-strength materials)</td>
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<tr>
<td>• Placing the emphasis on ‘good enough’ rather than on ‘as good as possible’</td>
</tr>
<tr>
<td>• Emphasising innovations that cannot be copied</td>
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</tbody>
</table>
“With innovation, it’s important to hit the target – that is, to meet market needs. From a technical perspective, that means being ‘good enough’ and not ‘as good as possible’.”
Udo Kreutzarek, GF Automotive, Head of Innovation Management

“Innovations aren’t necessarily just useful improvements; in particular, they can create effective added value for the customer.”
Dr. Martin Forrer, Fisba Optik, CTO / Head of R&D

“If the Chinese come up with a new idea first, then Swiss companies haven’t been listening carefully enough to their customers.”
Marcel Vorburger, GF AgieCharmilles, Head of Strategic Planning

“Driving forward innovations via sales channels means that we can feed customer-specific adaptations into the innovation process.”
Peter Tinner, Oerlikon, Executive Vice President, Head of Global Sales & Marketing

**Current examples of unused potential for innovation (continued)**

<table>
<thead>
<tr>
<th>Customer focus</th>
<th>Placing even greater emphasis on development geared to customer and/or market requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Driving forward ‘frugal innovations’ (that is, innovations that use cheaper and leaner production processes and are attractive to customers in both emerging and developed markets)</td>
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<td></td>
<td>Working towards close cooperation with customers over development</td>
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<td></td>
<td>Facilitating the customer experience (the ‘family office’ business model)</td>
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<table>
<thead>
<tr>
<th>Service focus</th>
<th>Carrying out prospective servicing</th>
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<tr>
<td></td>
<td>Developing better monitoring and intelligent diagnostic systems that will take preventive action</td>
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<table>
<thead>
<tr>
<th>Process focus</th>
<th>Developing innovations in the areas of machine networking and communications</th>
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<tbody>
<tr>
<td></td>
<td>Managing production innovatively (lean management and lean development)</td>
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<td></td>
<td>Drive forward ‘Industry 4.0’ topics, including intelligent factories and smart production methods</td>
</tr>
<tr>
<td></td>
<td>Building up links between the company’s own processes and external processes</td>
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<table>
<thead>
<tr>
<th>Cooperation and organisation focus</th>
<th>Boosting cooperation in the area of innovation with companies, suppliers, customers, development service providers and universities</th>
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<tbody>
<tr>
<td></td>
<td>Pursuing further ‘open innovation’ (opening up company boundaries)</td>
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<td></td>
<td>Developing innovative logistics models to improve the flow of materials</td>
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</tbody>
</table>
Quick checklist: Has your company answered the following questions relating to unused potential for innovation?

- How can I continue to protect our unique selling points (USPs)?
- How can I gear our R&D to the right areas, especially against the backdrop of an ever widening range of options (and the resulting greater scope for making mistakes)?
- What innovations can I make with the limited financial and human resources I have available?
- How can I develop new innovation platforms?
- How can I produce individualised customer solutions without exceeding the resources available in terms of engineer-hours?
- How can I find the right research skills and fill the posts (for example, innovative production stages in the value chain, new product services or manufacturing processes)?
- How can we retain our innovative edge over the rapidly developing emerging economies and industrial companies in new markets?

“Markets and cycles are no longer local to Switzerland: they’re global. The difficulty is making decisions about what the Chinese customer will want in two years’ time.”
Peter Tinner, Oerlikon, Executive Vice President, Head of Global Sales & Marketing

“A major challenge in future will be finding and filing the right innovative production stages in the value creation chain.”
Dr. Martin Forrer, Fisba Optik, CTO / Head of R&D
Deloitte considers three approaches as ‘best practice’ in tackling the three trends in innovation described earlier: more rapid innovation, internationalisation of R&D, and innovation that transcends product innovation. These three approaches are efficient management of innovation, global operating models for R&D and the ten types of innovation.

**Efficient management of innovation**
Successful management of innovation affects the entire company and involves four different aspects: strategy, organisation, project portfolio management and product development (see Chart 8).

**Chart 8. Managing innovation**

<table>
<thead>
<tr>
<th>Aspect of innovation</th>
<th>Key considerations</th>
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<tbody>
<tr>
<td><strong>Strategy</strong></td>
<td>• Customers: What are current and future market needs?</td>
</tr>
<tr>
<td></td>
<td>• Company capabilities: Do we have the appropriate know-how to satisfy future market needs, while being competitive and differentiable?</td>
</tr>
<tr>
<td></td>
<td>• Competitor: What are competitors doing in order to differentiate themselves, and how are they doing it?</td>
</tr>
<tr>
<td><strong>Organisation</strong></td>
<td>• Roles and responsibilities: What should be the roles of headquarter and divisions on a global and local level?</td>
</tr>
<tr>
<td></td>
<td>• Prioritisation framework: How is budget and people allocation being governed and applied?</td>
</tr>
<tr>
<td></td>
<td>• Tax: Is intellectual property (IP) optimally structured from a tax standpoint?</td>
</tr>
<tr>
<td><strong>Project portfolio management</strong></td>
<td>• ‘Make or buy’ framework: How are potential portfolio gaps being addressed?</td>
</tr>
<tr>
<td></td>
<td>• Innovation return on investment (ROI): How are investments in R&amp;D structured and monitored (KPIs)? Are risks being tracked?</td>
</tr>
<tr>
<td></td>
<td>• Product lifecycle management (PLM): Are we managing our product portfolio from a holistic perspective?</td>
</tr>
<tr>
<td><strong>Product development</strong></td>
<td>• HR: What incentive plans and people development schemes are in place?</td>
</tr>
<tr>
<td></td>
<td>• Supplier integration: Are suppliers used as a source of innovation?</td>
</tr>
<tr>
<td></td>
<td>• Controlling: Are ‘design to cost’ principles applied in product development?</td>
</tr>
<tr>
<td></td>
<td>• Information technology (IT): Is IT used as an ‘accelerator’ to R&amp;D (e.g. documentation)?</td>
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</tbody>
</table>

A company needs a comprehensive and decisive strategy that brings together all these aspects of innovation. It is important that companies evaluate customers’ current and future market requirements, assess their own strengths and know-how, and analyse their competitors so that they remain competitive and clearly differentiated.

In relation to the organisation of innovation, the priority is to define clear roles and responsibilities. This is particularly important in the case of global operating models for R&D, in which working processes and decision-making structures are determined at headquarters and regional level. Plans for budgetary and staffing priorities have a crucial role to play here. A further issue is how intellectual property (IP) can be optimally structured from a fiscal and financial perspective.

The priority in the case of project portfolio management is to decide how gaps in the product portfolio should be plugged — through the company’s own technology development or by technology buy-in. It is also important to pursue the return on investment (ROI) represented by innovations, for example by monitoring KPIs and identifying risks. In addition, it is also vital that the product portfolio is managed holistically.

In the case of product development, it is important to consider whether existing human resources are being used optimally. Other questions are: To what extent are suppliers already being used as sources of innovation? Are ‘design to cost’ principles being applied to development, and is information technology being used as an R&D accelerator (for example, in documentation and to share in global operating models)?
Global operating models for R&D

Multinational industrial companies take various approaches to R&D through workflows and decision-making structures (see Chart 9).

“Centralised research makes sense only where a number of customers are interested in the same topic. Where that is not the case, decentralised organisation is the better option.”

Georg Reif, 3A Composites, CTO

“Wherever production is located, innovation is happening, because continuous improvement processes are an automatic part of local production. And that is the beginning of local development and, actually, the germ cell of innovation.”

Silvère Leu, Meyer-Burger, Chief Innovation Officer

Managing globalisation successfully means understanding how workflows can be distributed across different locations. Most successful global operating models adopt one of the following three approaches:

- **Independent workflow** – in this approach, stand-alone, vertically-integrated organisations carry out R&D in a variety of locations.

- **Sequenced workflow** – each location carries out part of the entire R&D process and then hands on projects to the next location.

- **Integrated workflow** – this approach enables R&D staff in different locations to collaborate within an individual phase. Because it requires substantial coordination, it is often perceived as demanding and costly.

When companies are configured globally, it is also important to select the right decision-making structure to manage responsibilities for investment decisions, KPIs, HR management, and quality assurance. Most companies adopt one of the following three approaches:

- **Centralised decision-making structure** – in this approach, management is based in a single country, usually where the parent company is based, and decisions are made centrally by a management group.

- **Shared decision-making structure** – in this approach, management and R&D activity take place at the same location. Decision-makers are required by headquarters to steer projects and to speak with a single voice.

- **Decentralised decision-making structure** – in this approach, management is also based in the individual location but, in contrast to the shared decision-making structure, decision-makers work independently of one another.

The choice of an operating model is a key strategic decision and in many cases represents the first step in a journey leading to ‘change management’ becoming the key factor in the acceptance and implementation of a future-oriented operating model.
The ten types of innovation

Innovation has traditionally been offering-related and, therefore, based in the area of new product services and complementary product systems.

We would like, however, to expand this understanding of innovation to ten different types of innovation that, when taken together, reflect the full range of dimensions within a company. Innovation needs to be seen in relation to internal company models, processes and structures, which we refer to as configuration, and to customer-related functions, or experience (see Chart 10).

Chart 10. The ten types of innovation

The most successful companies use configuration, offering and experience to carve out new paths to innovation. Configuration includes the company’s profit model, its networks and relationships, its structure and organisation, and its processes, workflow and methods. Innovation may take place within the ‘experience’ setting in the areas of services and marketing channels as well as in terms of brand and consistent customer engagement.

Future competitive advantages can be generated from a comprehensive understanding of effective customer needs and of the ways in which upstream suppliers or sub-contractors can also contribute to innovation.

If they are to ‘reinvent innovation’, companies need to ask themselves the following key questions:

1. Are we familiar with the ten types of innovation in our sector and, if so, how many of them are we actually putting into operation? How can we reduce our dependency on products and technologies when these are the easiest things for our competitors to copy?

2. Which types of innovation are currently most important to customers? Where are the gaps in the innovation offering within the industry? These gaps often represent opportunities to outperform competitors.

3. How can different types of innovation be combined meaningfully to achieve significant impact on the market? Combining four or five different types of innovation often makes ‘disruptive innovations’.
An initial analysis will show which innovation types companies are currently using successfully. The second stage is to identify gaps in configuration, offering and customer experience in companies’ own portfolios and across the relevant sector. The final stage is to define how potential can be exploited by means of the different types of innovation.

Empirical research shows that when companies consistently follow this approach, the value of their shares rises compared to their competitors and also that the companies are valued much more highly on average than the S&P 500 index.

There are also clear contrasts with the top innovators, which are combining one or two, three or four, or five or more types of innovations: the greater the number of type, the greater the increase in share value (see Chart 11).

Chart 11. Share values of top innovators vs. S&P 500 index
[Base 100, 2007-11]

Of course, strong growth in share prices cannot be achieved solely by innovation. However, empirical research shows that it is vital that companies use the approaches suggested here to assess the opportunities represented by innovation and, where appropriate, ‘reinvent innovation’.

“These days, you can survive in networks only; even if you are a technology leader.”
Silvère Leu, Meyer-Burger, Chief Innovation Officer
Endnotes


   Bloomberg: Innovation Index. See also: http://www.bloomberg.com

3. Information from annual reports, analysts’ presentations and company websites. Handelszeitung Top 500. See also: http://www.handelszeitung.ch

4. Information from annual reports, analysts’ presentations and company websites.


Dr. Ralf C. Schlaepfer  
Managing Partner,  
Strategic Growth  
Direct: +41 (0) 58 279 66 86  
Mobile: +41 (0) 79 402 20 30  
Email: rschlaepfer@deloitte.ch

Markus Koch  
Consulting Partner  
Direct: +41 (0) 58 279 61 33  
Mobile: +41 (0) 79 773 48 14  
Email: markkoch@deloitte.ch

Dr. Philipp Merkofer  
Manufacturing Research  
Direct: +41 (0) 58 279 60 46  
Mobile: +41 (0) 79 875 85 30  
Email: pmerkofer@deloitte.ch
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Notes