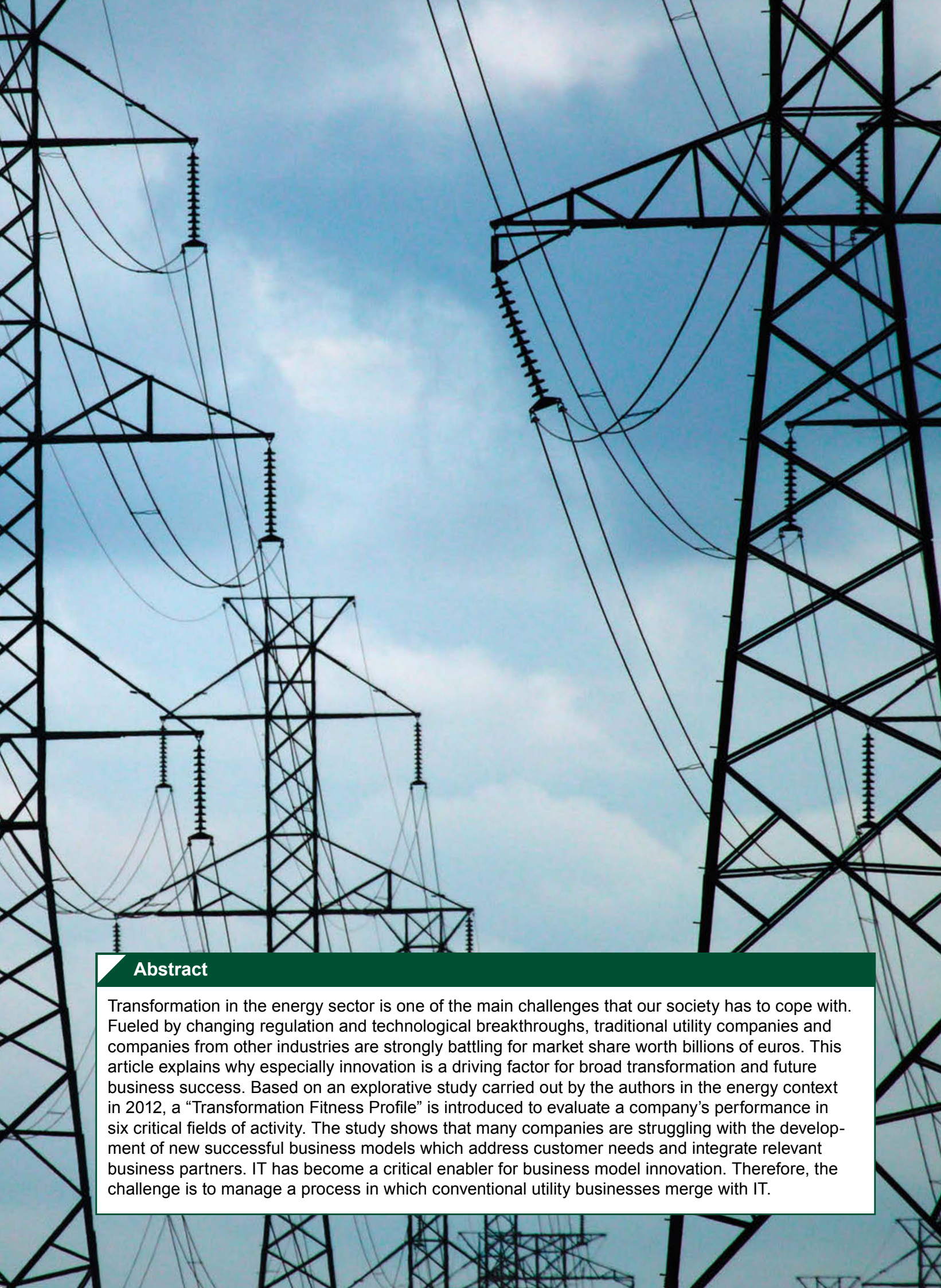


Abstract

Transformation in the energy sector is one of the main challenges that our society has to cope with. Fueled by changing regulation and technological breakthroughs, traditional utility companies and companies from other industries are strongly battling for market share worth billions of euros. This article explains why especially innovation is a driving factor for broad transformation and future business success. Based on an explorative study carried out by the authors in the energy context in 2012, a “Transformation Fitness Profile” is introduced to evaluate a company’s performance in six critical fields of activity. The study shows that many companies are struggling with the development of new successful business models which address customer needs and integrate relevant business partners. IT has become a critical enabler for business model innovation. Therefore, the challenge is to manage a process in which conventional utility businesses merge with IT.

TRANSFORMING UTILITIES

Success Based on a Fitness Diagnosis

Transformation in the energy sector is one of the main challenges that our society has to cope with. During this process, traditional utility companies and organizations from other industries are competing in a market worth billions of euros. This poses the question of what really counts for the successful transformation of utility companies into strong players in the new energy game.

by Hans-Gerd Servatius, Sebastian Kaczynski, and Klaus Lohnert

One of the main challenges that our society has to overcome is the comprehensive change of the utility industry – the so-called "energy revolution". During this transformation, traditional utilities are competing with organizations from other industries for a market worth billions of euros. We will show what it takes for utility companies to become successful players in the new energy world.

Firstly, we will present a phase model and describe where utility companies stand in this transformation process. Secondly, we will discuss the role of IT in relation to the new business models needed. We will then present the results of an explorative study in which we examined how far utility companies have advanced in terms of completing their change process and how they are managing it. Finally, we will present the "Transformation Fitness Profile" (TFP), which we developed to assess the transformation success of an organization and to discover opportunities for improvement.

From Evolution to Transformation

In view of the opportunities available on the one hand, and the pressure of politics, new competitors, and the broader public on the other hand, an increasing number of utility companies are looking into the question of how they can accomplish the necessary transition to business model innovation. In general, four phases can be distinguished.

Over the past decade, the change process has been more evolutionary in nature. The focus was on optimizing the status quo and its existing business models. The innovation efforts were aimed primarily at developing neighboring fields, for example, energy efficiency services for industrial customers.

A second phase, which could be referred to as the "experimentation phase", is characterized by a search for cooperation partners and involvement in pilot projects, such as E-Energy projects in Germany and the introduction of smart meters (Lauterborn et al. 2012). For instance, Georg Müller, Chairman of the Board of MVV Energie AG, characterizes the E-Energy model region Modellstadt Mannheim research project as a pilot project to verify feasibilities. To go beyond the experimentation stage, i.e. to develop concrete business mod-

els, the regulatory framework conditions, such as compliance with the relevant standards, need to be defined first (Müller 2012). Consequently, the innovation progress depends a lot on the interaction of the political and legal players and the companies.

Many utility companies currently find themselves in a state of transition to a third phase characterized by the systematic development of smart energy business models. This phase builds the foundation for a fourth phase where a comprehensive change based on new business models is taking place. However, no established players have been able to achieve this phase so far. One organizational challenge lies in successfully dealing with the coexistence of old and new business models. All in all, utility companies are facing an acceleration in their change process from an evolutionary to a transformative phase. This prompts the question of what companies can learn from other industries that have already successfully implemented large transformation programs.

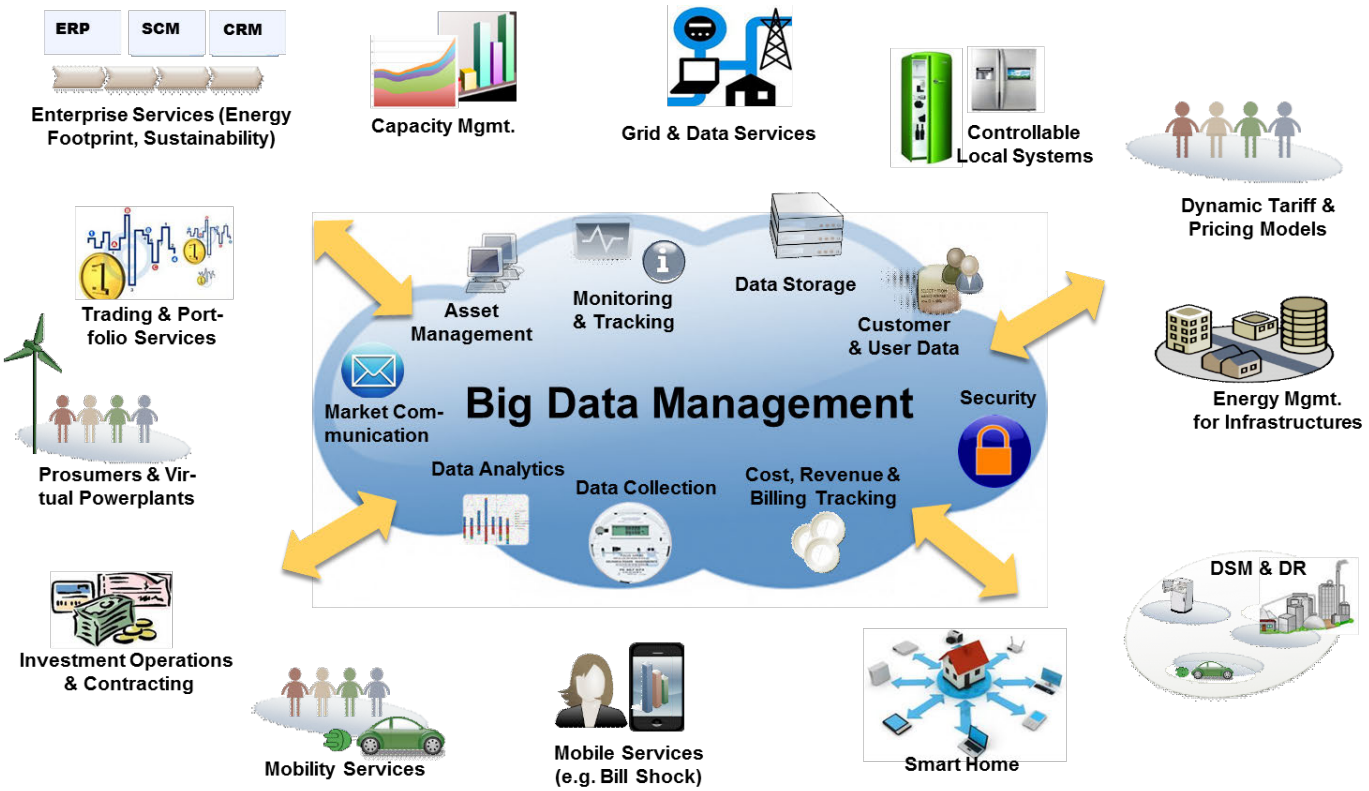
If utility companies do not act wisely, they risk not being able to expand their role beyond providing electricity, heating, and gas – products which have become commodities nowadays.

The conceptual foundations of corporate transformation were developed in the 1980s and 1990s (Gouillart and Kelly 1995). This forms the basis of modular programs, of which the Business Transformation Management Methodology (BTM^2) is so far the most comprehensive approach (Uhl and Gollenia 2012). Some utility companies have begun to implement an industry-specific adaptation of BTM^2 (Lauterborn et al. 2012).

IT Management as an Enabler for Innovation

In contrast to the transformation wave of the 1990s, information and communication technology is no longer just an enabler for process innovations, but an enabler for new business models. In the energy sector this is especially true for the construction of smart grids and smart markets incorporating symbioses of new products, services, and forward-looking technologies. Therefore utility companies ought to develop these fields together with companies from sectors like telecommunication, building services, IT, energy and household appliance technology. If utility companies do not act wisely, they risk not being able to expand their role beyond providing electricity, heating, and gas – products which have become commodities nowadays. In this respect, for most industry players choosing the right partners is of existential significance in order to be able to cope with the energy revolution (Servatius 2012).

Utility companies' arduous entry into the new smart world usually begins with the introduction of smart meters in the context of pilot projects. Smart meters are electronic meters with corresponding communication interfaces which enable detailed information about consumption, production, and capacities to be recorded and made available automatically and without delay. Smart meters are thus an important cornerstone for the energy revolution because they increase effectiveness and efficiency in harmonizing the energy-supply side with the demand side. This is a critical feature for making smarter use of energy and stabilizing the power grid system towards the increasing share of fluctuating generation by renewable energies such as particularly typical to wind and solar power. On the way to achieving a more sustainable energy supply system, the importance of measured data will therefore rise strongly, leading to big data volumes with which utility companies will have to cope. The term "big data" denotes "datasets whose



size is beyond the ability of typical database software tools to capture, store, manage, and analyze". (Manyika et al. 2011, p. 1).

In this context, the German Federal Network Agency (Bundesnetzagentur 2011) predicts that – in terms of the future of energy supply – almost all (conceivable) business models will be based on measured data. When combined with data from various sources, like commercial applications, geo data, meteorological data, and other target-group specific information, this provides promising opportunities for business model innovation (see fig. 1). Consequently, the management of big data with regard to its recording, handling, and translation into smart data will be a key ability for the transformation of utility organizations. Particularly managing big data for both

- the identification of promising customer requirements and
- the design of target-oriented service offerings

forms the centerpiece of future business model innovation.

Such service offerings can focus on all market players and may include innovation topics like demand side management, demand response, virtual power plant systems, and smart homes as well as grid services and the granularization of energy tariffs.

In the fast changing utilities framework – which is driven by the energy revolution and its contextual urge for business transformation – especially the availability and applicability of next-generation IT are becoming decisive for business success, since the requirements for big data management cannot be met by conventional technologies. Innovative technologies such as SAP HANA are crucial for successfully performing the management tasks associated with big data. HANA stands for "High-Performance Analytic Appliance", and it can carry out complex data processing operations almost in real time speeding up analyses so they are performed in less than a thousandth of their usual runtime. Suddenly, processes that seemed inconceiv-

Fig. 1: Big Data Management forms the centerpiece of future business models in the energy sector (source: SAP)

able with conventional technologies are possible and IT unlocks new business dimensions (Lohnert 2012).
Other game changing technologies for managing big data as well as orchestrating processes, IT architectures, and organizations are cloud computing and mobile connectivity. Data security and fast, harmonious system operation are critical issues with these applications. Hence appropriate software must meet highest standards. Solutions which fulfill the requirement, e.g. SAP Mobile and SAP Cloud, are already available on the market and enable organizations to leverage market success factors with regard to :

- Real-time-oriented communication with various target groups
- Efficient incorporation of partner networks
- Cross-divisional and company-wide processing
- Harmonization of new and existing system landscapes
- Increasing profitability by using abstracted IT infrastructures (for example computer hardware resources, platform and software environments).

Make-or-buy decisions and developing partnership solutions play an important role in translating big data into smart data.

Challenging Cross-Sectional IT Pillars

In a nutshell, there are three cross-sectional IT pillars – big data, mobile connectivity, and cloud computing – and orchestrating them will present a new and critical challenge for utility companies. Even if IT solutions are available, their implementation efforts must not be underestimated. It requires broad transformation processes and a new way of thinking which will hardly be achieved without intensive change management measures. Employees ought to be systematically integrated, motivated, and enabled for change since, ultimately, their efficiency level in using the new IT landscapes is the deciding factor in the success or failure of the IT implementation. In view of the financial and staff resources and also the IT competencies required, not all companies in the energy sector will be capable of establishing themselves as providers of big data, mobile and cloud solutions. In this respect, companies must define in their business strategies how to maximize individual efficiencies in these fields of technology. For cost-effective systems operation, exploiting the potentials of economies of scale is vital. As a consequence, make-or-buy decisions and developing partnership solutions play an important role in translating big data into smart data. This applies to both the providers and the consumers of corresponding IT services. In this IT facet of the energy industry in particular, it is expected that a separate market will evolve in which companies with large resources gain competitive advantage in the orchestration of mobile connectivity, cloud computing, and big data analytics to provide its clients with high-performance data processing services of the location. Such services could include detailed analyses of consumption, feed-in, and network status data; those are crucial for business areas relating to demand side management and demand response, e-mobility, virtual power plant systems, and grid operation models.
Utility companies are under strong pressure as the trend towards renewable energy production and new market participants lead to a decline in many utility companies' energy generation levels and sales. The utility companies which find themselves under such pressure are well advised to react proactively to this technology-induced transformation op-

portunity. Other industries which have already undergone comparable developments, such as the telecommunication sector, clearly see what promises to be a profitable outlook in the energy market change for the future. Take for example Deutsche Telekom and Vodafone, which have already been able to tie up their first deals in the business areas of smart metering and virtual power plant systems. Hence, in the battle for market shares, utility companies will have to act quickly, build upon their strengths in energy expertise and customer access, and become innovative. It will be interesting to see to what extent they are able to catch up in developing IT and innovation competencies in order not to be outpaced by the more experienced players originating from other industries.

Results of an Explorative Study

As part of an explorative study, we developed a discussion guide and carried out interviews with representatives from various European utility companies of different sizes. The aim was to examine how utility companies are managing their change process. The following paragraphs will summarize our main findings. All participants confirmed that their companies are currently facing considerable internal and external difficulties. They worry about staying competitive through the energy revolution and listed several external challenges: inconsistent political frameworks, new competitors, changing customer expectations, the system integration of decentralized power plants, and the need to involve the general public more actively than before. In particular, the power grid operators complain about the regulators' focus on cost reductions and demand more support for innovation. When looking at their internal challenges, the utility companies mentioned resistance to change, relatively little experience with innovation, uncertainty about financing major investments, and difficulties in implementing the findings of research in successful new business models.

The discussion output confirms that the utility companies have not started the actual transformation process yet. Many interviewees think they are in a long evolutionary process that extends beyond the year 2020. So far, few companies have recognized and communicated internally and externally the comprehensive character of the upcoming transformation. Those who do talk about transformation apply a "countercurrent model" with both top-down and bottom-up elements: Initially, there is the realization that the necessary change is more than just evolution and requires a more comprehensive and well-governed transformation. The CEO usually considers himself a driver for this development and emphasizes the key significance of IT as an enabler for new business models. Despite this top-down element, the employees have a relatively large degree of freedom during the implementation phase. They are responsible for how change is achieved and must learn to cope with this empowerment. Considering the importance of this bottom-up element, it is crucial to communicate to the employees the need for transformation and explain how

Utility companies will have to act quickly, build upon their strengths in energy expertise and customer access, and become innovative.

to structure the learning processes that the empowerment necessitates. Since the regulatory framework is seen as an obstruction that hinders innovation, the question also arises of how the regulator can be involved better in the transformation process.

In order to find innovative business models, some of the examined companies

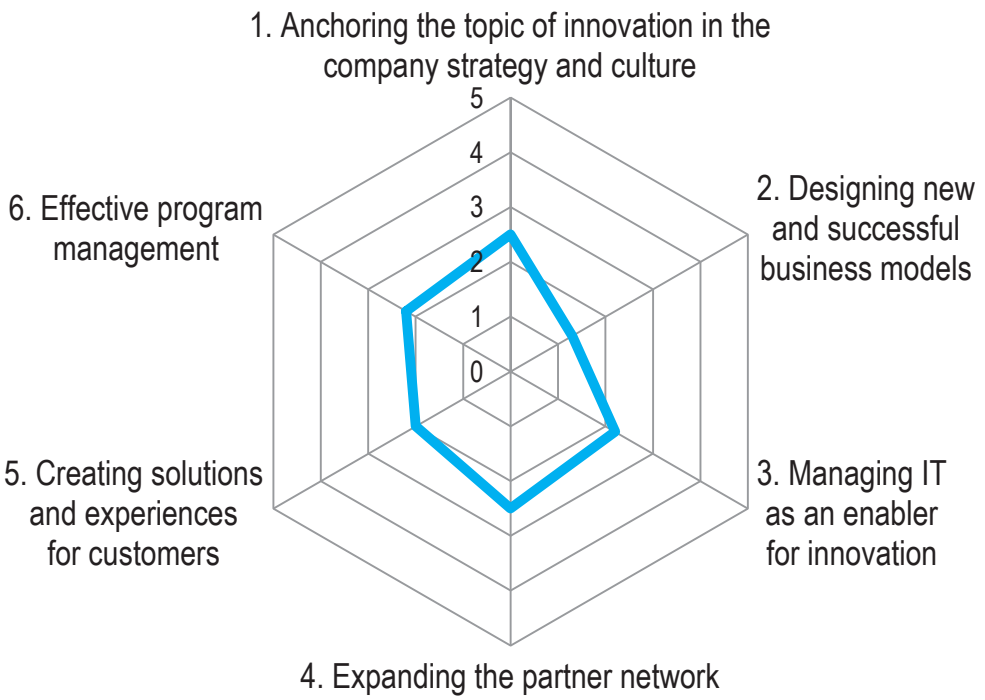


Fig. 2: Transformation fitness profile along the six fields of activity (source: SAP/ Competivation)

used instruments like spin-offs and subject-specific innovation labs. A large utility company founded a spin-off in order to find innovations for technology and business models and to be more agile compared to their large and rather slow corporate structure. Another large interviewed company set up subject-specific innovation labs and appointed key contact persons. They work together virtually, for example on the topic of smart homes, where they defined basic products that can be expanded in a modular fashion. The aim is to retain customers in the long term.

A particularly innovative company sees itself as a "facilitator of energy transition", representing rather an exception in our study. In 2011, this grid operator, talking explicitly about transformation, established special transformation teams at management and IT levels. Communication tasks are very important for both teams. To this end, an "alignment initiative" was launched. This approach was chosen because the company had no previous experience with transformation processes. An element of this cultural transformation involved equipping all employees with smart meters and the suitable apps. Nonetheless, this company does not use a comprehensive methodology for transformation, but rather applies a kind of "mental framework". While this lack of methodology is not considered problematic, the management of the employees and influencing the customers' behavior are regarded as crucial elements. Furthermore, the situation is analyzed from three perspectives: economic, technological, and regulatory. Appropriate solutions are still being sought to maintain a balance between the regulatory and the economic aspects.

Of all the companies surveyed, only one has already anchored the new energy world in its organization. In each area of top management, departments were created to promote these new core issues. The necessary coordination across all top management areas is carried out by another newly created central department called "Smart Energy". In conjunc-

Fitness criterion: Function of IT within the organization

Fitness points

5 Active integration of the IT department into the Corporate Strategy Unit (close cooperation: “IT is regarded as an enabler for business”), and the organization pursues business innovation supported by a specific IT roadmap.

4 Active integration of the IT department into the Corporate Strategy Unit (close cooperation: “IT is regarded as an enabler for business”).

3 Regular meetings with the IT department to validate how new solutions for business units may fit into the IT landscape.

2 Awareness of the increasing importance of IT, whereas corresponding initiatives to develop the organization’s IT have not been launched.

1 IT is used only for operational problem solving, and the IT department is excluded from the Corporate Strategy Unit.

Fitness criterion: Statuses of IT partnership models

Fitness points

5 IT partnerships are established, further pursued, and well maintained.

4 Processes for informed decision-making on IT-based make-or-buy scenarios are established.

3 Awareness of the importance of establishing IT partnerships, and first measures for partnership-building were initiated.

2 Awareness of the importance of establishing IT partnerships, whereas measures for partnership-building have not been initiated.

1 No awareness of the importance of establishing IT partnerships.

Fitness criterion: Organizational implementation of innovative IT — singular assessments of IT for a) mobile, b) cloud, c) big data

Fitness points

5 Corresponding IT solution is considered a central driver for innovation, and the organization is already pursuing a specific roadmap for the IT implementation.

4 Corresponding IT solution is implemented in pilot projects.

3 Phase(s) for testing and/ or evaluation of corresponding IT solutions started.

2 Awareness of the importance of the corresponding IT solution, whereas initiatives for its development have not been launched.

1 IT solution is unknown and/ or considered not relevant for the organization.

Fig. 3: Criteria for the field of activity called “Managing IT as an enabler for innovation” (source: SAP/ Competivation)

tion with the relevant specialist departments, IT in particular is perceived as a critical link since a smart world cannot be created without overarching IT solutions. Partner management represents a special challenge and most of the study participants concede that a solution has not yet been found for this. It is also increasingly important for medium-sized and large utility companies to establish partner networks with IT companies, if they want to position themselves as holistic problem-solvers. The complexity of this task is deemed to be very high. Merging conventional utility businesses with IT is seen as a critical success factor.

A key issue is the analysis and interpretation of data, as well as their intelligent commercialization. Participants argue that even if internal IT expertise is available, additional competency from outside must be purchased. IT management could become a bottleneck and should be integrated in the decision-making processes at an earlier stage. One challenge of working together with external IT partners is to clearly define the handover points. In the case of IT platforms, for example, telecommunication and IT companies should be careful not to threaten the business model of their partners from the energy sector. Small partners may benefit in the short term, but in the long term, the big telecom and IT players will probably take the lead.

As direct customer contact is central to the successful establishment of trust and genuine relationships in the field of e.g. smart homes and energy services, choosing the right partner as a reliable local representative is crucial for every utility company. The biggest risk is posed by players from other sectors. It seems important to develop links with suitable implementation partners, for example from skilled trades, who can solve local customer problems. This also includes franchise models for integrated system solutions.

A major utility company, for example, which created a new sales unit for innovative products, sees potential conflicts with its traditional sales approach in the sense of a “controlled clash of cultures”.

How these conflicts develop remains to be seen. So far, this company has been dissatisfied with its sales successes in terms of innovative products. They see transformation as an opportunity, but think it should be better communicated. One of their worst-case scenarios assumes that industry outsiders take over the customer processes.

Utility Transformation Fitness Profile

The findings of the explorative study allowed us to derive fields of activity that companies are recommended to undertake when implementing an innovation-driven transformation. We found the following six main fields of activity and defined them as dimensions of a fitness profile for utility company transformations:

1. Anchoring the topic of innovation in the company strategy and culture
2. Designing new and successful business models
3. Managing IT as an enabler for innovation
4. Expanding the partner network
5. Creating solutions and experiences for customers
6. Coordinating theses activities with an effective program management.

Figure 2 shows the fitness profile diagram for the six dimensions and thus provides an overview of a company's performance and what progress has been achieved in implementing an innovation-driven transformation. In addition to that utility companies also face the task of streamlining their organization and cutting costs.

The Transformation Fitness Profile (TFP) considers the utility company's transformation fitness levels from a holistic perspective and provides an insight into which fields of activity and fitness criteria need to be improved. The concept is flexible and can be adapted to the respective situation.

Each of the six fields of activity is evaluated along several transformation-specific fitness criteria. In turn, each criterion is measured on a scale ranging from 1 to 5, with "5" indicating the highest fitness level. The individual descriptions for each response alternative ensure a transparent and standardized assessment process. Figure 3 shows an example taken from the field of activity "Managing IT as an enabler for innovation".

The sum of fitness points achieved across all criteria presents the fitness level of a company in a certain field of activity. From there a Transformation Fitness Index can be calculated as a measure for the overall performance.

Utility companies have so far lacked a systematic assessment tool for progress in terms of major change processes. The TFP addresses this problem by enabling holistic and systematic analyses and transparent evaluation across the sum of all the relevant fields of activity. We have already started to implement the tool in several pilot projects and are pushing forward its incremental and individualized development.

Key Learnings

- In the history of the modern energy sector, coping with the energy revolution and ensuring competitiveness present the biggest challenges for utility companies: they need to transform.
- Many utility companies find themselves in a state between experimentation and business model innovation. New profitable business models have not been implemented yet.
- An important nucleus for change is stemming from Business Model Innovation Labs. The coordination across different Board-of-Management areas can be realized by means of a Smart Energy Unit.
- Energy and IT expertise are converging; analysis and interpretation of big data are a key competence. The management of partner networks and of the local customer interface for smart energy services are critical success factors.
- The presented Transformation Fitness Profile (TFP) provides a holistic and systematic assessment tool for the status and progress of large innovation-driven change processes.

Service

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