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Development of Innovative Business of Telecommunication Operator: Case of KT-MEG

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ABSTRACT

Mobile operators globally are endeavoring to expand beyond legacy communications/media business to create new growth engine based on information and communication technology (ICT). This research studies the case of KT to see how a mobile operator expanded beyond its existing offerings to new smart energy business leveraging digital technology. Details were analyzed specifically how the business was developed, why the smart energy service was started, and what the success factors were. KT's smart energy business (KT-MEG: KT Micro Energy Grid) utilizes ICT to resolve energy issues such as global climate change and energy consumption growth and provides growth opportunities for KT with its KT-MEG platform. We analyze that KT was able to leverage sustainability as a new growth engine by developing new businesses to differentiate customer experience, creating effective organization structure, and generating business impact in addition to leveraging latest ICT technologies such as artificial intelligence, IoT (Internet of Things) and big data.

KEYWORDS

Ambidextrous Organization, Business Transformation, Customer Experience Differentiation, Disruptive Innovation, Smart Energy

1. INTRODUCTION

Telecommunications operators around the world are contemplating and competing intensely to secure new growth engine for future revenue (Kang, Ryu, & Kim, 2010). As mobile markets become saturated, adding subscribers into operators' networks is becoming much more difficult while regulatory pressure from the governments to drive the price down are limiting operators' profitability. Hence, the operators are endeavoring to expand beyond the traditional telecommunications business to new business opportunities via means such as M&A (Mergers and Acquisitions) and investment in new technologies (Jang, 2017). Examples include operators from a diverse range of markets. Verizon, a telecommunications operator in the United States of America, acquired online contents firm AOL (America Online) and internet business, Yahoo. AT&T, another telecommunications operator in the United States of America, acquired Direct TV and Time Warners. Softbank from Japan acquired a

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semiconductor chipset design company ARM. China is no exception where all three operators (China Mobile, China Unicom and China Telecom), invested in non-telecommunications firms such as Alibaba and in new technologies such as Internet of Things and Artificial intelligence. The industry is rapidly changing, which is especially highlighted in the mentions of a merger between T-Mobile and Sprint in the USA. The merger does not merely grow the scale of the companies but also enables the merged firms to acquire competence to prepare for the future (Deloitte Consulting, 2017).

Korean operators (SK Telecom, KT, and LG Uplus) are no exception to this trend as they face saturation of revenue after explosive growth in the data traffic due to the adoption of smartphone. For example, the ARPU (Average Revenue per User) of the companies reduced from 2014 to 2017. SKT's ARPU fell from USD 32.26 to USD 31.13, LG Uplus' fell from USD 33.34 to USD 30.72, and KT's fell from USD 31.91 to USD 30.37 (Source: Investment Relations Presentations from respective companies).

Therefore, Korean operators are attempting to expand beyond its conventional mobile communications business in order to develop a new growth engine. Indeed, Korean operators have already acknowledged the importance of climate change (e.g., [1]risk of blackout in hot summer seasons, [2]Paris Agreement, policy support for renewable energy) and have been pushing the business of smart energy forward among many new business development candidates.

The smart energy business developed by Korean telecommunications operators is distinct from traditional energy demand businesses, where SI (Systems Integrator) firms replace large energy consuming equipment with highly efficient equipment, replace filament lamps with LED (Light Emitting Diode) lights and deploy energy management systems in venues such as offices and factories. This is because Korean telecommunications operators can leverage ICT (Information and Communications Technology) infrastructure, already owned by them, and exploit the full potential of ICT (Jeong, Kim, & Yoo, 2013). It is therefore very interesting to investigate the cases of Korean operators where sustainability becomes a potential growth opportunity rather than a mandatory obligation to comply.

Therefore, this paper studies the case of KT, which is driving the most innovative energy service based on ICT in Korean market and exhibiting noteworthy performance, called KT-MEG (KT's Micro Energy Grid). We conducted in-depth with staffs in the product owner organization, R&D organization and management support organization that are affiliated with KT-MEG. This is to identify the unique characteristics, the performance and the key success factors of KT-MEG. The three research questions below will be answered in this case study:

1. What differentiation of customer experience does KT-MEG provide?
2. How did KT operate its organization to develop KT-MEG?
3. Why did KT enter traditional energy demand market with its new ICT-based energy technology among many other possibilities?

The composition of the contents is as follows. The section 2 analyzes KT's energy business and strategy. Section 3 and 4 confirm and discuss the performance of KT's smart energy business. Section 5 analyzes success factors of the business and section 6 concludes with new strategies for telecommunications operators: energy-centric business transformation

2. LITERATURE REVIEW

2.1. Customer Experience Differentiation

While service industry is taking a greater portion of the global economy, the competition within the industry is becoming fiercer. Therefore, firms are taking customer experience differentiation as the winning move, which leverages the individual needs of different customers (Lee, 2009).

"Differentiation" is defined as the uniqueness and the individuality that only one possesses, which is enabled by the mechanisms of human perception. It is known that a person tends to remember more of an experience that provides greater and a variety of stimuli. For example, only 10% of reading, 20% of listening, 30% of seeing, and 70% of peaking are committed to memory. This figure increases when a variety of stimuli are coupled: 50% of seeing while listening and 90% of speaking and acting are committed to memory. In other words, the human perception processes memory by receiving information and comparing it with previously acquired memory to determine which information to commit to memory (Neumeier, 2005).

Traditional differentiation strategy leverages feature & benefit marketing to emphasize the benefits (e.g., design, price and speed) that are relatively easier to be perceived by the customers. Such strategy requires a firm to engage in price wars and quick time-to-market. This indicates that perceptually simple differentiation is limited in effect and impact duration, but experience-based differentiation is different as experience provides the basis of memory that influences decision making. Therefore, differentiation of experience taps into the memory of customers to distinguish the subject from other product/service.

In the market today, it is very effective to respond to the competitive landscape by taking into account the following in service design: satisfy customer experience based on experience differentiation rather than merely fulfilling the features that are easily perceived by the customers (Shin, Choi, & Moon, 2009). Customers tend to base their repurchase decisions or influence other's purchase decisions based on the image created by the differentiated experience.

2.2. Ambidextrous Organization

The paradox of innovation states that the efficiency of a firm is proportional to its scale but innovation of the firm is inversely proportional to its scale, indicating the difficulty of a large firm to be innovative. Today's firms are pressured to enhance efficiency (e.g., cost reduction) and to innovate at the same time. That is, the firm must efficiently utilize its current competence while developing new competence for the future (Raisch, Birkinshaw, Probst, & Tushman, 2009).

Ambidextrous organization, a concept raised by Charles O'Reilly and Michael Tushman, is an organization that pursues stability based on its legacy businesses on one hand while pursuing new and innovative items (e.g., items that are likely to be pursued by venture firms) on the other hand (Kang, Park, Yun, & Jung, 2014).

This is the type of organizational structure that a firm must adopt if it has large scale or has very lucrative and profitable legacy businesses (Simsek, Heavey, Veiga, & Souder, 2009). This is because firms tend to settle for the status quo and become obtuse to changes in the world, and it is difficult for them to realize the future trends and potential crises in the midst of current profit. Therefore, this organizational structure attempts to encourage firms to try new items/approaches in order to enhance problem solving skills. Applying this in the field would mean that the firm needs to be divided into a team that oversees legacy business and another team that prepares for the future. These teams would require its own respective organizational structure, operational system, corporate culture and office space, while the executives would need to invigorate and encourage the teams to persistently challenge for innovation. Therefore, ambidextrous organization is an effective structure for successful firms to not settle for what it has succeeded but to persistently innovate.

2.3. Disruptive Innovation

Innovation inherently implies that it completely transforms old custom, institution, organization and methodology into a new counterpart. In other words, it creates something different from the existing ones (Amabile, 1988).

Clayton Christensen described the superficially understood process of innovation and creation with the concept of disruptive innovation in his book 'Innovator's Dilemma'. He classified innovation into sustaining innovation and disruptive innovation (Christensen, 2013).

Sustaining innovation is what the public usually refers to as improvement (Yang, Park, & Lim, 2015). It enhances quality/performance based on existing good/service. For example, enhancing speed of a product or improving the process to reduce fault rates. The sustaining innovation provides better quality and performance to extend and continue the current industry structure. Therefore, the incumbents' competence is enhanced while new firms' entry into market would become more difficult.

On the other hand, disruptive innovation drives fundamental change. This is also understood as 'an innovation that changes the rule of the game' as it provides new performance attribute that existing good/service cannot provide. Unlike the connotation of disruptive, the disruptive innovation neither occurs only in the high-tech industries nor requires surprising/radical processes. In can be created in any good/service, where new good/service will survive in the market if it provides additional value on top of the existing value and, if not, will perish.

There are two types of disruptive innovation: low-end and new-market. Low-end disruptive innovation occurs when new product based on low-cost technology is released in the market where mainstream products overachieve the needs of the customers. New-market, on the other hand, creates a new market based on rules of game that are different from that of the existing market (Christensen, Raynor, & McDonald, 2015).

Disruptive innovation tends to be driven by new firms as it requires new value propositions that are not emphasized by incumbents. New innovation shakes the market formed by past innovations and creates a new market based on the new products. In this process, incumbents that are used to past value propositions are likely to encounter crisis if they do not adapt to the new change.

Therefore, in the perpetual innovation process, the firm that targets disruptive innovation must consider the reason existing products were not able to provide demanded value and provide clear resolution to the reason to create completely new value that supersedes existing products (Lee, Kim, & Kim, 2017).

As any market leader can plummet and face crisis, firms must pursue innovation and creativeness to prepare for the rapidly changing industry landscape.

3. OVERVIEW OF KT'S SMART ENERGY BUSINESS

3.1. Background: South Korea's Energy Landscape and KT-MEG

South Korea has mainly relied on fossil fuels (65.7%) and nuclear energy (30.0%) to fuel its economy while the contribution of renewable energy has been marginal (4.3%). This was mostly due to the nature of Korea's energy market where government/public sector has tight control. For example, KEPCO (Korea Electric Power Corporation), Korea's public utility company, was the only firm that had responsibility to generate and supply Korea's energy until 2015 (GSMA, 2017).

However, the governments and energy suppliers started to recognize the advantages of renewable and smart energy systems. To stimulate the sector, the government introduced phased liberalization of the Korean energy market. Furthermore, government also sponsored R&D (Research and Development) project 'Korea Micro Energy Grid' that formed the basis of KT-MEG (KT-Micro Energy Grid: KT's smart grid solution) (GSMA, 2017).

KT runs in total of USD 20 billion businesses including mobile business, which has the second largest market share in Korean mobile communications market, and fixed businesses such as fixed internet and IPTV (Internet Protocol Television) (both with the top market share in the Korean market). In 2014, KT acknowledged the need for new growth engine and identified five new platform business opportunities in 2014: media, smart energy, enhancing public value of firms, finance and public safety.

The reason behind the selection of smart energy as one of the new business opportunities was that KT possessed a nationwide ICT infrastructure based on national network coverage, which leads to KT consuming 0.5% of Korea's overall energy consumption (2500GWh amounting to USD 300 million electricity fee in 2016). This is necessary to maintain the nationwide coverage of vast ICT

infrastructure, and hence reduction of energy cost was a critical issue for KT to resolve. With these issues, KT was able to accumulate know-hows on optimizing the operation efficiency. Furthermore, KT adopted new innovations in energy demand technology based on big data analytics, artificial intelligence and cloud infrastructure.

This was a golden opportunity for KT, as it was able to apply much of its traditional strengths to the utilities sector. KT's competence in managing secure and reliable connected solutions, excellent billing platform, already established nationwide networks and significant investment in cutting-edge technologies such as artificial intelligence (AI) and Mobile IoT (Internet of Things) (Low Power Wide Area Network in licensed spectrum) were all relevant for the sustained development of Korean energy market (GSMA, 2017).

3.2. KT-MEG Business Scope and Evolution

In December 2015, KT commercialized KT-MEG after conducting government-sponsored R&D project 'Korea Micro Energy Grid'. KT-MEG is an integrated total control and management platform for energy that integrates energy experts and KT's core competence of 24/7 control and management.

KT MEG is, in essence, convergence of KT's ICT capability on energy industry and provides various services such as renewable energy (energy generation), energy efficiency (energy demand) and electric vehicle charging & energy demand operation (energy trade) to various venues including photovoltaic power plants, apartments, office buildings, hospitals, hotels and factories.

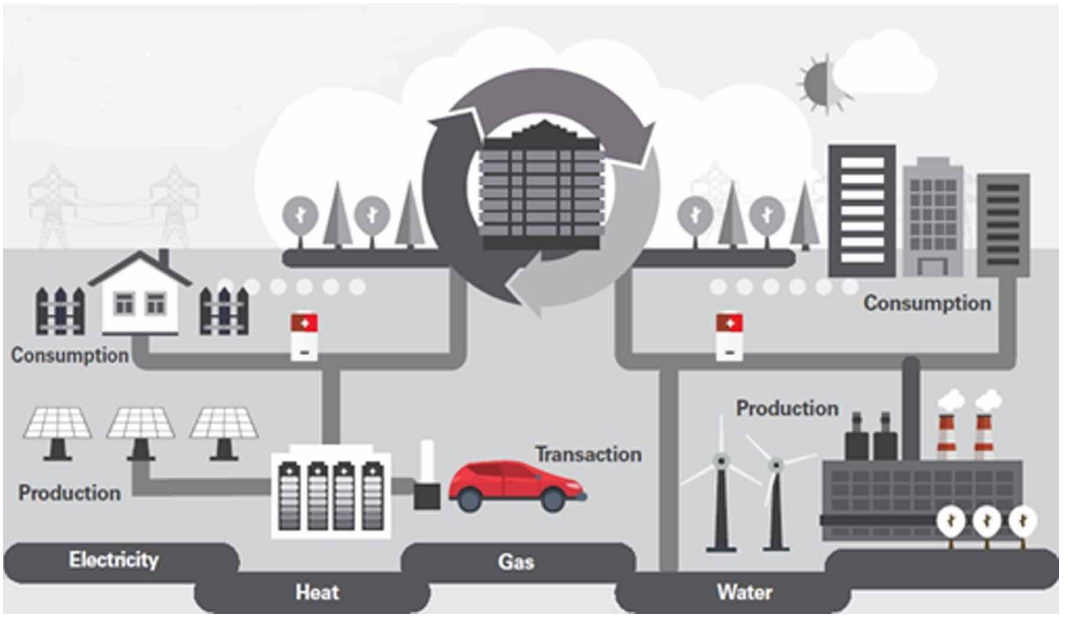
KT MEG is available to both energy consumption and generation, where customers can connect to KT-MEG through LTE-M (Long Term Evolution for Machines), 3G (3rd Generation)/LTE (Long Term Evolution), RFID (Radio Frequency Identification), fixed-line communications, and NB-IoT (Narrowband IoT) that is to be supported by the end of 2018). As various types of connectivity are supported, KT-MEG has very few restrictions on the type of customers it can serve. With the commercial launch of Mobile IoT (licensed spectrum low power wide area technologies), the service will be able to further expand the reach. Energy use is relayed to the network control center in Gwacheon city, where experts monitor site usage and micro grid demand. These experts inform the customers on ways to ensure optimal grid balancing and power distribution. KT's cloud-based analytics platform, the 'e-Brain', enables this as it analyses usage trends and performs diagnostics in real time. KT's e-Brain is based on machine-learning and therefore is able to factor weather, usage patterns and profitability to generate its own prediction models that enable efficient management of energy generation, energy consumption and energy trading (Figure 1).

In energy generation, KT analyzes in real-time the factors that reduce efficiency of photovoltaic power plants (e.g., failures, overheating and dust) to maximize energy generation. KT also provides real-time remote failure response service for service recovery. KT's offerings are not limited to management of photovoltaic power plants but also in deployment of the power plants. In 2014, KT already deployed 7.5MW capacity photovoltaic power plant in Daecheok city with total of 13MW of deployment up to date (13MW is a capacity for 3,800 households to use electricity annually). KT-MEG monitors the status of power plants in real-time while providing reliable and economic management/operation of power plants with big data analytics based on various data (e.g., climate status and electricity generation status).

In energy consumption, KT aims to provide energy cost reduction and reliable operation by optimal management of energy facilities of venues such as buildings, factories and hospitals. This is enabled by heat/electricity consumption demand forecast based on big data analytics and guidance on optimal operations & energy reduction. For example, KT helped hospital "P", with capacity of 500 infirmaries, to reduce its energy consumption by 30% with its ICT capability. A sports complex "B" in Gwangju also experienced a 75% reduction in its energy use by using KT-MEG.

For energy trading, KT additionally obtained license as an electricity grid service provider to provide re-selling of electricity and electric vehicle charging. KT's electricity vehicle offering, with mobile charging, expands the adoption of electricity vehicle by 50% while reducing the deployment

Figure 1. The comprehensive scope of KT's smart energy solution (Source: KT Sustainability Report)



cost of charging infrastructure by 83%. This is accelerating the deployment of electricity vehicle charging infrastructure in Korea.

There are also trials on energy demand resource operations, where mechanisms for forecasting situations requiring quick charging are in progress. This maximizes the energy reduction capability and consequently the stability of the electric grid.

The management and control of these services are centralized in KT-MEG Center (In Gyeonggi-do Gwacheon), where 35 energy specialists reside in the center for 24/7. The response becomes quicker when the center interconnects with KT's customer centers, which are spread throughout the nation (see Figure 2).

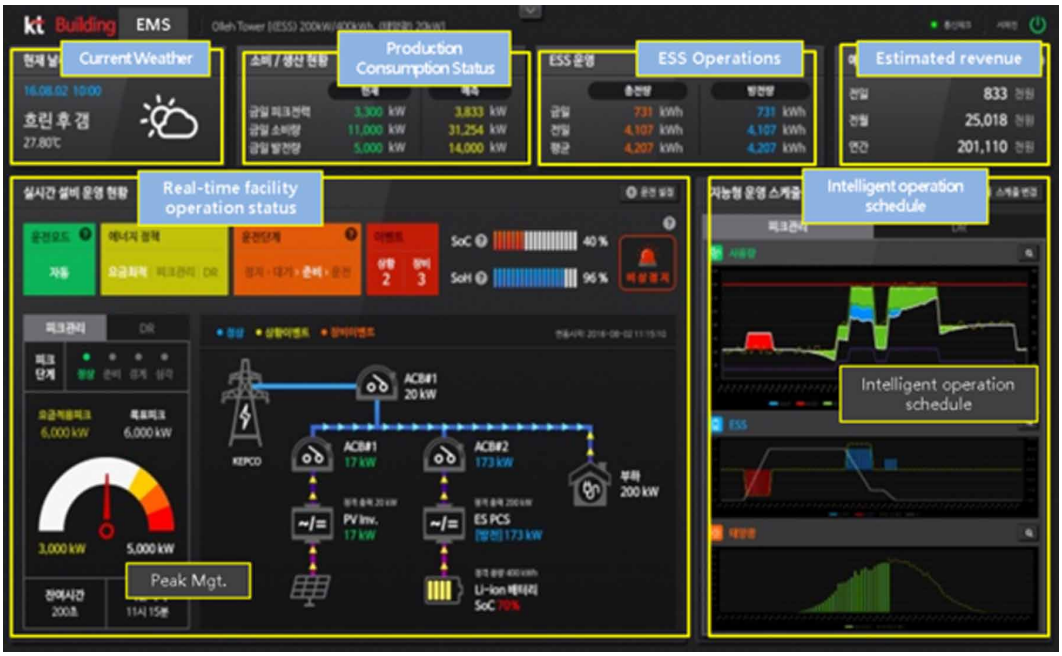
Figure 2. Photo of KT-MEG center (Source: KT)

3.3. KT-MEG Solution

KT-MEG has already been applied to buildings with high energy consumption such as Hospital and Sports Complex. The savings are realized by replacing some of the heat pumps with a

new one and applying optimized control services. That is, KT-MEG continuously monitors the energy consumption of a building via measurements from sensors, building internal management system and IoT (Internet of Things). In the process, KT-MEG identifies various opportunities for savings and optimizes the equipment control to exploit those opportunities. KT-MEG specifically analyzes the effects of prominent variables (e.g., time of the day, day of the analysis, weather and season) on energy consumption to not only identify reduction opportunities but also forecasts peak hours of energy consumption (see Figure 3). In Figure 3, KT-MEG provides the user information on the current weather, the status of energy

Figure 3. Information panel of KT-MEG system (Source: KT)



production & consumption and the estimated revenue based on the operations. Furthermore, it also monitors how much has been charged and discharged by energy storage system (ESS) operations, the real-time status of operating different facilities monitored by the system, and finally the schedule of intelligent operation. This enables KT-MEG to preemptively identify measures to reduce energy consumption, resulting in innovative energy savings in addition to that of simply equipment replacement.

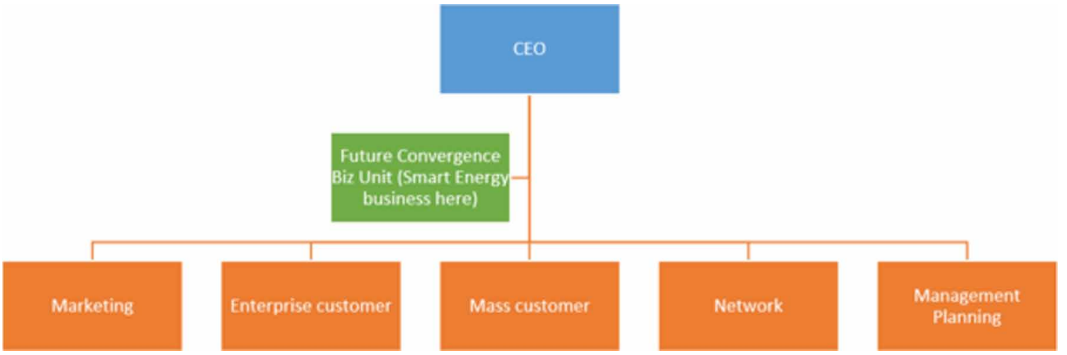
Hospital "P" that has 500 infirmaries experienced total of 71.8% energy reduction in January 2017 when it experimentally applied KT-MEG. Out of the 71.8%, 53.6% attributed to replacement of heat pump while additional 18.2% was attributed to ICT-based optimization capability of KT-MEG. The sports complex "H" also identified, with help of e-Brain big data analytics engine in KT-MEG, that the biggest opportunity for energy savings is 180tons of hot water disposed by Sauna facilities. With optimized plans of KT-MEG implemented, the sports complex was able to reduce its annual energy costs by 75% from KRW 280 million in 2016 to KRW 70M in 2017.

4. BUSINESS PERFORMANCE OF KT'S SMART ENERGY BUSINESS

4.1. Revenue Growth

The smart energy business leveraging KT's ICT capability is not only enhancing KT's brand image, but also enabling a new revenue stream. KT made less than KRW 20 billion in 2015, but in 2016 it monitored and controlled 851 sites through KT-MEG in 2016 leading to 100% growth in revenue (Park, 2017). In the first half of 2017, KT already made sales of KRW 100 billion with annual sales target of KRW 200 billion. Currently, KT-MEG Center is monitoring and controlling 3,300 sites (including energy efficiency consulting, demand resource operations and electric vehicle charging) currently (GSMA, 2017). In the future, it will integrate ESS (Energy Storage System) and AMI (Advanced Metering Infrastructure) to expand and advance KT-MEG system. Figure 4 concisely shows the growth of business performance of KT's smart energy business.

Figure 4. Organizational structure for KT (Source: Internal interview with KT's employee)



KT's performance has attracted attention of its competitors in Korea (SK Telecom and LG Uplus) and they are also considering new energy services leveraging ICT capability as new business items. In addition, Korean regulators see KT's business as an opportunity to foster energy industry and adoption of environment-friendly energy sources.

4.2. Enhancing KT's Image and Status

Every year, world's largest exhibition of mobile and information communications technology is held in Barcelona, Spain. This exhibition is called Mobile World Congress (MWC) and KT's KT-MEG smart energy platform was awarded the best mobile award in the smart city in MWC Global Mobile Awards 2017 (Seoul Newspaper, 2017). Global Mobile Awards is awarded by GSMA (GSM Association), which unites over 800 mobile operators and 300 companies in the broader mobile ecosystem and is considered as the "Oscar award" in the field of ICT. The smart city category awards services that contributed to changes and advances in smart cities by leveraging mobile technologies.

In addition to awards, KT deployed energy management systems in Las Vegas (Sahara Hotel) and Chicago (Montgomery), and also deployed 3G-based AMI systems in Uzbekistan along with independent Photovoltaic power generation facilities (with Energy Storage System) in Rwanda. KT's performance is not limited to the Korean market, but KT is expanding globally with its technological excellence.

4.3. Transformation to Environment-friendly Firm

KT has been selected as the best company for 4 consecutive years from 2013 by the Carbon Disclosure Project, a project that evaluates excellence in environmental management. It was also listed in the Carbon Management Honors Club for 4 consecutive years until 2017 (Chun, 2016).

As the selection illustrates, KT is considering developing its smart energy business beyond mere revenue creation to contributing to international environmental issues. KT already has been minimizing the energy consumption of networks by introducing energy efficient equipment and optimization of cooling systems. It has also been replacing lighting with higher efficiency LED lights to reduce building energy consumption. Recently, KT announced that it will replace a tenth (1,000) of its fleet of corporate vehicles (10,000) with electric vehicles and will be replacing all vehicles whose lifecycle ends with electric vehicles by 2020 (Lim, 2017). They currently have 30 electric vehicle charging sites within their offices but plans to extend it to all 400 offices to support its electric vehicles.

With its smart energy business, KT expects to reduce air pollution (e.g., fine dust and carbon monoxide) and operations & fuel cost for its corporate vehicles. This means that KT seeks not only business performance, but also remedies for international environmental issues.

5. KEY SUCCESS FACTORS

5.1. Customer Perspective: Differentiation of Customer Experience (Generation, Demand and Trade of Energy)

Traditional marketing emphasizes the features and the benefits of a product and considers consumer's processing of marketing stimulus as an important step. Bernd H. Schmitt from University of Columbia, however, emphasizes the role of experiential marketing, where customer experience in using the product is differentiated, in decision-making (Schmitt, 2010).

Rather than focusing on the results of new technologies, KT focused on creating a completely new customer experience in the energy business. This is because KT considered identification of unexplored markets/demands of the customer's lifestyle would be much more significant for the customer and the business than merely applying new technology to an existing market. In other words, KT prioritized systematically creating sustainable and novel customer experience based on technological insight. This was to ensure that KT established a firm brand in the new energy market as a new entrant.

As a result, KT did not focus on identifying the needs or the usage patterns of the customers, as this approach is useful for incremental innovation of existing products but not appropriate for developing completely new products that customers are not accustomed. Rather, KT integrated its network management and control capability based on KT-MEG Center to provide End-to-End management and control in energy market. This provides a completely new experience that no other traditional provider was able to support. This can be interpreted as an improvement of customer "experience" on existing energy markets with KT's ICT capability.

In this perspective, KT attempted to enhance the End-to-End customer experience that ranges from energy generation to energy demand and finally to energy trade. KT's major focus is seen in Table 1.

Table 1. KT's questions to achieve end-to-end experience (Source: KT)

Energy Generation	Energy Demand	Energy Trade
• How to enhance energy generation efficiency while maintaining the capacity of photovoltaic power plant and energy storage system?	• Is it possible to check the efficiency of energy consumption by comparing different neighbors/groups surrounding the user? • How to reduce the total energy cost?	• How to provide energy with less cost? • How to generate more profit from the generated energy in a stable manner?

Furthermore, while energy re-selling is not legally permitted, KT is aiming to expand its smart energy business to electricity trading. This is to prepare for the future growth and to exploit synergy with its current offerings of energy management & renewable energy businesses. Taking into the upcoming changes in the future energy paradigm, KT is considering becoming an energy prosumer where it will enable energy producers to sell energy directly to the consumers.

The key technology in this vision is intelligent analytics based on energy big data, which is an intelligent service that maximizes energy generation for energy producers, energy efficiency for energy consumers and optimizes transactions for energy market participants. KT is satisfying a diverse range of customer needs that arise from energy generation, energy demand and energy trade.

5.2. Organization Perspective: Ambidextrous Organization for New Energy Business

KT has been offering a portfolio of telecommunications services including internet and IPTV centered on the mobile communications proposition. However, new businesses often require risk-taking culture, long-term perspective and independent decision making, let alone overcome the inapplicability of knowledge and know-how from the existing businesses. This means that it is difficult to manage and develop both legacy business and new business in the same organization.

It is extremely difficult for a large established corporation like KT to create an independent organization focused on new business development. However, KT created Future Convergence Business Unit directly reporting to the CEO (Chief Executive Officer), which allows KT to be an ambidextrous organization that can maintain legacy businesses while taking risks to develop new businesses.

Ambidextrous organization is a concept proposed by Charles O'Reilly from Stanford University from his studies in the success and failures of various firms. In order for a large firm to sustain its market leadership and survive, ambidextrous organization is indispensable in order to maintain legacy business and experiment for new business (O'Reilly & Tushman, 2004).

Ambidextrous organization enables a firm to acquire competence in both traditional markets and new markets. In other words, it can be defined as the coexistence of exploitation, which enhances the efficiency of the firm and reduces the risk, and exploration, which takes risks to exploit creativity. Simply put, ambidextrous organization is an organization that explores new opportunities while exploiting the core legacy competence. Such a firm innovates legacy products to gain competitive advantage and, at the same time, acquires new knowledge/capability to develop new innovative products to enter into a new market.

KT recognized that dependence on only legacy businesses, no matter how profitable and effective the legacy business model is, cannot ensure sustainable revenue streams. Therefore, it was considering, even in the past, the means to proactively react to the changes and reallocate resources for legacy businesses towards new capability development.

The reason behind making an independent organization directly reporting to the CEO is because KT, with its immense size, is likely to be immersed in inertia when developing new businesses. This means that KT is likely to over-estimate the methods of legacy business such that it may avoid investing in new business models with some risk even if its legacy businesses are under threat.

The biggest issue in this process is striking a balance between legacy and new businesses. KT has sustained success with one telecommunications business, but it recognized the importance of new growth engines and transformed itself into an ambidextrous organization by making an independent organization focusing on new businesses that directly reports to the CEO.

5.3. Service Perspective: Disruptive Innovation With New Technology (Big Data and IoT)

When starting its smart energy business, KT noted that many enterprise customers (e.g., residential buildings, hotels and smart factories) do not have good knowledge/information of their energy costs

(e.g., plans, reduction opportunities and equipment lifecycle management). For small buildings, there were no energy specialists and therefore were less interested in reduction opportunities or had no capability to identify those opportunities even if they were interested.

Therefore, KT aimed at the low-end of the energy market and provided simple and affordable building energy reduction service called "Enereyes" to be distributed freely to building customers. This is in accordance with disruptive innovation as described by Innovator's Dilemma by Prof. Christensen. The Enereyes service is a mix of "energy" and "eyes" that analyzes building energy status and automatically provides cost reduction opportunities. KT debuted "Enereyes free" that can appeal to low-end target segment with affordable and attractive value proposition.

The unique feature of this service is that it utilizes the monthly usage data (iSmart) from KEPCO (Korean electricity company) and consolidates it with data collected by meters in 15-minute intervals. The data is then analyzed by KT's AI-based analytics engine to identify energy consumption patterns, which then suggests alternative energy consumption patterns optimized for the customer. Apartment "S" located in Daegu Korea was able to reduce 70% of annual shared electricity costs (i.e. cost not specific to households but are shared by all households in the apartment) by applying Enereyes service.

The big data analytics engine "ebrain" analyzes the variance of energy consumption patterns depending on different variables (e.g., time, day and weather) and deduces relevant cost reduction opportunities. It also forecasts the energy consumption and predicts the peak demand time, which enables customers to reduce cost by managing energy demand and peak demand.

The Enereyes service is expected to be developed further and lite version will be offered soon. This version will monitor and predict energy consumption in real-time to provide professional consulting for energy reduction and a Premium version is also under development. This version will include real-time 24 hours monitoring and control of energy status of a building along with replacement of energy facilities.

Ultimately, KT aims to expand beyond enterprise buildings to consumer markets with the disruptive services. When KT brands itself as the new innovator in the energy services, we expect KT to be able to compete with direct supplier of electricity (KEPCO) in energy management market.

6. CONCLUSION

6.1. Implications of the Study

The 4th industrial revolution is expected to converge and add intelligence to traditional industries with latest technologies such as artificial intelligence, cloud, big data and IoT. As a result, boundaries distinguishing industries are blurring and business models are rapidly changing, where firms are faced with new opportunities for changes in all aspects ranging from technology, infrastructure, process and platform. This case study analyzed the case of Korean mobile operator KT to see how a mobile operator expanded beyond its existing offerings of mobile, internet and media services to new businesses leveraging digital technology. The case study also analyzed in-depth how the business was developed, what the success factors were, and what the performance of the new business was.

KT's smart energy business utilizes ICT to resolve energy issues such as global climate change and energy consumption growth and provides growth opportunities for KT with its KT-MEG platform. KT-MEG platform analyzes, using ebrain engine, big data collected from energy generation, consumption and trade to diagnose the energy issues along with forecast and alternatives. This provides new service experience for the customers and therefore makes KT-MEG an "integrated service platform business".

In this process, KT approached the issue in the perspective of innovation and applied aggressive measures to develop the energy businesses. For example, it did not pursue its traditional way (e.g., system, organization and means) of developing services but employed innovative approaches to foster competence and focusing intentionally on new businesses.

We expect that KT's case can be beneficial for other mobile operators in finding new growth opportunities in sustainability rather than perceiving it as a liability. We hope that other mobile

operators and ICT companies will learn from this case and develop new businesses to differentiate customer experience, to create effective organization structure, and to generate business impact in addition to leveraging latest ICT technologies such as artificial intelligence, IoT and big data.

6.2. Limitations of This Research and Future Topics for Study

While this research was able to analyze the smart energy business of KT in the perspective of business transformation with details of business scope/strategy/organization, this research was not able to evaluate the business in the perspective of KT's employees and in the perspective of ICT industry as a whole. Therefore, future studies should, based on the results of this research, focus on the evaluation of the business from both in and out of the firm, the quantitative measurement of the impact of KT's smart energy business and comparative analysis with business transformation cases of non-Korean mobile operator. Such topics would provide more meaningful results that can benefit practice, academia and the ecosystem overall.

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ENDNOTES

1 As risks and concerns over blackout persist due to instability of energy supply, there is a need for low cost sustainable alternative energy

2 The Paris Agreement now makes reduction of carbon emissions mandatory rather than optional. It has enabled attraction of global interest in reduction of energy consumption and greenhouse gas emissions

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