Management of Innovation in Global Organizations Case of Schlumberger

Achille Wabo Djepum
Memorial University of Newfoundland

Continuous innovation is a key driver of organizations success. This principle holds true for entrepreneurial ventures and global organizations. How do global organizations manage technological innovation to maintain incumbency over the years? Our research will probe a global company (Schlumberger) innovation management strategy considering sound technological innovation principles. Due to limited data availability, we have referenced Schlumberger's most relevant public source titled "This is Schlumberger – 90 years of technical innovation". We found that innovation strategies contributing to SLB success include dynamic capabilities, strategic acquisitions, technology integration, fostering innovation as core value, customer-focused organizational structure, effective knowledge management and sustaining innovation.

Keywords: strategic management, technological innovation, MTI, global organization, Schlumberger, SLB.

INTRODUCTION

Schlumberger, the pioneer of electrical logging was born in the 1920s from an idea of the brothers Marcel and Conrad Schlumberger who set out to measure (logging) subsurface electrical resistivity of the rocks with the aim to reveal geological structures that could trap hydrocarbons (SLB, 2017, p. 11). Starting from this radical innovation that made the company's core competency to date, Schlumberger has managed to remain a leading provider of upstream oilfield services with 105,000 employees and presence in 120 countries (Appendix 1).

Tidd and Besant (2009) found that 85% of new ideas never reach the market. Whenever they reach the market there are various factors that will threaten its profitability and/or leadership position in the market. We found it remarkable for such a large company not only to stay in the market but to maintain its incumbency for nearly 100 years. This triggers our interest in decoding the Why, What and How can a global organization manage to achieve such track record.

Our objective in this paper is twofold. Firstly, we will investigate the challenges faced by global organizations in managing technical innovation. Secondly, we will explore what technology management strategies have benefited the company to maintain incumbency over nearly 100 years of existence. Finally, we will draw recommendations on key innovation management strategies that would benefits global organizations.

METHODOLOGY

A case study approach was adopted for this paper. Due to the proprietary nature of internal company's documentation, we have opted to use public sources of company's information, namely the SLB history Book and 2018 global stewardship report. These 02 publications were qualitatively screened using a decision matrix based on following criteria:

- **Relevance**: Both are reliable and pertinent source of information since they were officially published by the company
- **Validation**: SLB publications typically undergo thorough internal reviews by marketing, commercial, intellectual property (IP) managers, and approval by senior executives including CEO/Chairman amongst others.
- **Peer Reviewed**: SLB history book is available at the US congress library which implies that accuracy of its content is verified to some extent. The 2018 Global stewardship report is industry recognized.

The rationale of using Schlumberger case as the basis of our research paper lies in the fact that it is a global successful organization and I am very familiar with its activities having been an employee for over 12 years.

ANALYSIS & DISCUSSION

We have identified 5 key challenges facing the management of innovation in SLB. For sake of clarity we will go through each challenge, the strategy employed by the company and discuss the technology management principles supporting the success of these strategies.

Challenge #1: Managing Technological Venture

At the time Schlumberger was founded (1926), the equipment used for prospection consisted of common electrical instruments available on the market such as potentiometers. The innovation lied in the way these instruments were combined and the idea that electrical current could be used for subsurface exploration. In the early 1927, other geophysical exploration methods, especially Seismics became quite efficient compared to SLB's Electrical surface prospecting method and took away SLB business in some regions such as the US Gulf Coast.

Strategy: SLB's dynamic capabilities allowed its founders to respond with an architectural innovation (Schilling, 2013, p. 119).

The major change in SLB's new method was making the measurement inside the borehole rather than on the ground surface. SLB brothers first experimented downhole (DH) electrical measurement 6 years earlier in 1921 but results were inconclusive. The principles of measurement remained the same, however common off-the-shelf equipment was replaced with a Sonde lowered downhole with a winch to make electrical measurements at specified step intervals (every 1 meter).

Outcome: By the end of 1938 SLB had over 170 crews conducting Electrical logging using this method in all oil prospecting countries worldwide (SLB, 2017, p. 78).

Management of Technology Innovation (MTI) principle: The Creativity of Schlumberger brothers, Sound knowledge management coupled with tight appropriability regimes helped SLB benefit from its innovations.

Had Conrad and Marcel not experimented the feasibility of downhole measurements 6 years ago, they would not have reacted quickly enough to the disruption from Seismics companies. Although it takes approximately 6 to 8 years to bring new ideas to market, Conrad and Marcel were able to commercialize DH electrical logging within a year thanks to their creativity that gave them a head start in this enhanced method. People's creativity has always been at the heart of the company, have been embedded into company's core values – ***People***, ***Technology*** and ***Profit*** and still holds true today.

SLB knowledge management strategy fosters a knowledge sharing culture to address the needs of the oil and gas (O&G) industry. In 2018, SLB knowledge sharing database (Intouch) was searched 7.7 million

times. To facilitate networking, each employee maintains a curriculum Vitae on SLB Intranet. These were accessed more than 7.6 million times annually (SLB, 2019, p. 61). Appendix 2 shows some facts about SLB Knowledge sharing activities.

When the first experiments were conducted back in 1912, Conrad had filed his first patent in France and by 1926 had filed patents in 18 countries which helped secure the core of company's IP (SLB, 2017, p. 20). This demonstrates a proactive IP strategy.

Challenge #2: Funding Mechanisms and Leadership

In the early days, Marcel and Conrad Schlumberger benefited from generous funding from their father Paul Schlumberger who was a successful businessman in textile industry, in the amount of FRF 500,000 (equivalent of USD 1 million today). In return, the sons had to focus their invention efforts exclusively on the field of subsurface study (SLB, 2017, pp. 64-65).

In the absence of family funding or an angel investor as was the case of SLB, a radical or disruptive innovation of this nature could benefit from Private investor, Corporate partner (joint venture or Seed capital) or commercial Venture Capital depending on the stage of evolution of the technology being funded (Naranayan 2001, p. 481).

MTI principle: Leadership role, Vision setting, culture of pioneer spirit. (Naranayan, 2001). Leadership played a crucial role in setting the orientations that would shape the company as we know today. Starting from the Father Paul Schlumberger who had a keen interest in Sciences although he did not pursue his dreams on his own. Nevertheless, he oriented his sons' education to sciences and supported them with focused investments to develop their idea of electrical logging (SLB, 2017, pp. 63-67). The choice and contributions of their collaborators furthered SLB enterprise to reach new heights. All collaborators, from the president, division unit managers to field crews shared a common value of pioneers. Each management staff advanced the company's establishment in many ways. Appendix 3 highlights some of the remarkable people and their contributions to SLB. Field crews did not enjoy the working conditions we have today. "Travelling, procuring and preparing food was a daily challenge. Yet they simply rolled up their sleeves and went to work" (SLB, 2017, pp. 45-46).

Challenge #3: Technology Adoption and Diffusion

By mid 1930s, after the electrical logging method was truly proven, SLB actively expanded its presence in all countries drilling for oil: Venezuela, USA, Canada, Dutch, West Indies and the Middle east. Aggressive marketing and pricing strategies. For instance, pre-empting by charging a fixed monthly sum contract for conducting all logging operations for the entire year was employed (SLB, 2017, p. 66). Evangelism by advertising using a flashy flyer (SLB, 2017, p. 73) presented in Appendix 5, writing papers and presenting to industry conferences (SLB, 2017, p. 146) were some of the methods employed.

Outcome: SLB succeeded in penetrating the international market by late 1930s, only 01 decade after the first commercial application of electrical logging (1927).

MTI principle: SLB effectively used methods for crossing the chasm i.e. the discontinuity between the early adopters and the early majority (Moore, 1998). These methods included, evangelism, refining accuracy and reliability, pre-empting and marketing.

MTI principle: Establishing a dominant design. Although borehole measurements with Sonde was proven, there were still reluctance from industry experts. SLB had to campaign to establish its network externalities with the intent of setting Electrical DH Sonde as a dominant design or a Standard. Methods used included publications, presenting at Industry conferences and physical presence in all countries where O&G drilling activity was ongoing.

Being first to entry and prior the establishment of a dominant design in these market, Suarez & Utterback (1995) postulates that Electrical logging's probability of failure is much lower compared to the scenario where SLB would have enter the market after a dominant design had been established.

Nowadays, we are witnessing that SLB method of Electrical DH logging, now called Wireline Logging or Measurements and Logging While Drilling (MLWD) are the Industry standards for logging Open Hole.

Challenge #4: Growth Through Strategic Acquisitions and Internal Developments

Strategy: Soon after SLB breakthroughs on its electrical logging the founders soon realized the growing trend in electronics industry and its importance for logging business, a competency where they were lagging. They decided to enter the sector by acquiring Daystrom (1962), Fairchild Camera and Instrument corporation (1979) and Manufacturing data system (1980), just to list those (SLB, 2017, p. 36)

MTI principle: Internalize core competencies either through internal development or strategic acquisitions. Guided by Christensen's (2006) Resource-Process-Priority (RPP) model, SLB would have decided what competencies would be obtained through acquisitions and whether the new acquisitions would fit and be assimilated into SLB's current processes or rather managed as standalone product lines.

In 1930, SLB fine-tuned its logging technology from a point-to-point system to a continuous -recording system. In 1931, another breakthrough, the spontaneous potential (SP) was added into the company's portfolio of services. SP enables to distinguish between permeable and non-permeable formations. The Historical highlights of major internal development breakthroughs is summarized in Appendix 3.

Few firms have all the in-house capabilities to compete globally (Doz and Hamel, 1997, p. 556). Internal development has the advantage of using company's existing resources while Acquisitions enabled rapid market entry. Both constitute optimum entry strategies for SLB when entering a new familiar market and target technologies/services will be incorporated into a Base product (Robert and Berry, 1997, p. 544).

SLB considered its core field of competency to be data collection and processing. Hence, this guided its strategy of acquiring targeted companies excelling in other competencies they were lacking. A comprehensive list of SLB acquisitions is presented in Appendix 4.

Challenge #5: Organizational Structure

During the World War II, most employees were either drafted or voluntarily reported to serve their countries, including the founders, top executives such as Rene Seydoux (CEO), Henri Doll inventor and scientist. More inventions were made as contributions to the war effort, some of which were later incorporated into SLB technologies. Henri Doll invented an electromagnetic device to detect mines (SLB, 2017, p. 79), Conrad Schlumberger developed a device using sound refraction to locate enemy's artillery (SLB, 2017, p. 15).

Besides, in order to secure its assets, the crucial pieces such as prototypes were shipped to Houston that will later become company's global headquarters (HQ) (SLB, 2017, p. 78). While operation was forced to stop in Europe and Americas, SLB expanded its business to Middle East.

Outcome: Not only the act of service demonstrated the founders' authentic ethical values, but it also furthered their creativity since some of the principle of their war inventions were later incorporated into logging devices. We believe it also facilitated the company's expansion and settling worldwide. After the WWII, the SLB group of companies had to reconfigure its organigram from a Product line structure to a geographical grouping into 4 areas: North America, Latin America, Europe & Africa, Middle East and Asia. With 01 HQ in each area, the new structure provided proximity to customers, hence better service focused organization (SLB, 2017, p. 49).

MTI principle: A decentralized organization provides proximity and better insight into customer's challenges, hence produces technology that directly addresses client needs (Agyres & Silvermann, 2004, pp 929-958). SLB Technology was tested on various environments and provided room for further improvements (SLB, 2017, p. 45).

Challenge #6: Coupling With Government Institutions, Industry and Academia

In this section our objective is twofold. Firstly, we will explore the contributions of SLB technology to global stewardship. Secondly, we will demonstrate how global stewardship, in particular, stakeholders management can be leveraged to benefit the company's advancement in technology.

Governments and Institutions: SLB is supporting the United Nation Sustainable Development Goals (SDGs). At each regional level, SLB focuses on 11 out of the 17 SDGs where they can achieve the greatest impact (SLB, 2019, p. 7). "SLB Technology helps customers decrease emissions, save energy reduce resources and waste throughout each phase of the oil and gas exploration and production process" (SLB,

2019, p. 23). Appendix 6 shows some examples of SLB technologies and their benefits to global stewardship.

Industry: SLB has supported external innovation by co-developing and co-investing promising technologies such as energy storage, wireless power with startup companies via its Corporate Venture Group. (SLB, 2019, p. 57).

Academia: SLB has ongoing collaboration with universities that are directly relevant to the challenges facing the O&G industry, including Artificial Intelligence, machine learning, cybersecurity and virtual reality. Members of SLB leadership serve on university boards around the world. SLB sponsors academic chairs and invest in scholarships (SLB, 2019, p. 58). Appendix 7 summarizes key fact of SLB active involvement with academia.

MTI principle: Christensen (1997) on disruptive technologies advises to create an independent venture unit separate from the mainstream business with the only mandate to develop the disruptive technologies. Narayan (2001) also describes the same mechanism for building innovative firms using New Venture Division. This is what SLB has achieved with Government Institutions, Industry and Academia through its Corporate Venture Funds. Not only this strategy contributes to the advancement of research and innovation, but it ensures the company has a strong foothold in targeted sectors, should these technology sectors emerge as established dominant designs or standards to the benefits of O&G or become disruptive technologies to O&G.

CONCLUSION

Global technological organizations do not startup outright at a global scale. Throughout this paper, we have demonstrated how effective use of sound management of technological innovation (MTI) principles must be observed to nurture and grow a revolutionary idea into successful commercialization; and under the right leadership it is possible to improve the chances of reaching the global stage and remain in leadership position for many decades. SLB has developed effective strategies to manage the following challenges:

1. Managing technological venture
2. Funding Mechanisms and Leadership
3. Technology Adoption and Diffusion
4. Growth through strategic acquisitions and Internal developments
5. Decentralized, customer-focused Organizational Structure
6. Coupling with Government Institutions, Industry and Academia

Innovation management strategies are not one size fits all. What has worked well for SLB may not work for another similar organization. For instance, all organizations will not have the luxury of fulfilling all their startup funding needs from personal or family sources. Private investors, Venture Capitalist may impose their active choice over what idea to pursue over what idea to abandon at the detriment of the original inventor's idea, which could negatively influence the fate of the venture. Such scenario was not covered on this paper, which warrants careful analysis of the specific case at hand in order to select appropriate MTI strategies.

REFERENCES

Argyres, N.S., & Silvermann, B. (2004). R&D, organization structure, and the development of corporate technological knowledge. *Strategic Management Journal*, *25*, 929-958.

Christensen, C. (1997). *The Innovator's Dilemma* (pp. ix-xxiv). New York. New York, USA: Harper Business

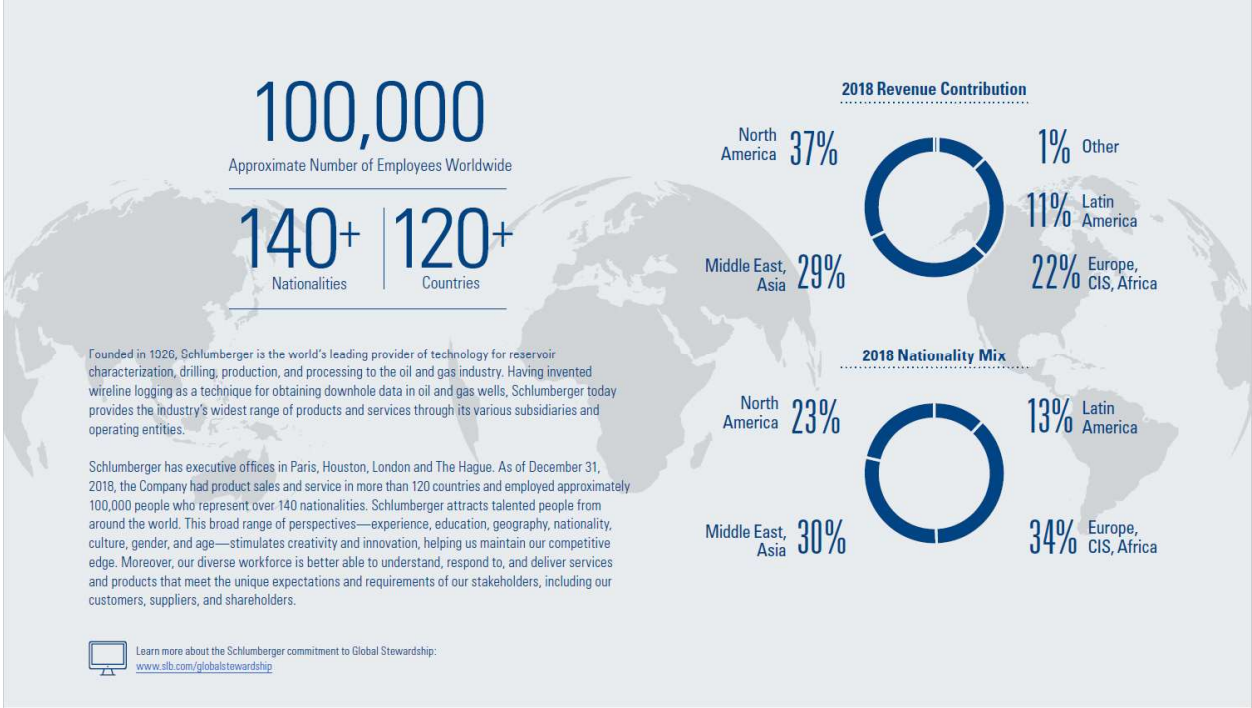
Christensen, C. (2006). *Assessing Your Organization's Capabilities: Resources, Processes, and Priorities*. HBS 607014-PDF-ENG.

Moore, G. (1999). High-Tech Market Illusion. In *Crossing the Chasm* (pp. 9-25). New York, USA: Harper Collins

Narayanan, V.K. (2001). *Managing Technology and Innovation for Competitive Advantage*. Prentice New Jersey: Prentice Hall.
Schilling, M. (2013). *Strategic Management of Innovation*. New York: McGraw-Hill.
Schlumberger Limited. (2017). *This is Schlumberger: 90 years of technical innovation*. Schlumberger. Retrieved from https://www.slb.com/who-we-are/our-history
Schlumberger Limited. (2019). *2018 Global Stewardship Report.* Schlumberger. Retrieved from https://www.slb.com/globalstewardship/pdf/Schlumberger_GlobalStewardship_2018.pdf
Suárez, F.F., & Utterback, J.M. (1995). Dominant designs and the survival of firms. *Strategic Management Journal*, *16*, 415-30.
Tidd, J., & Bessant, J. (2009). *Managing Innovation*. Oxford: John Wiley. Oxford, UK.
Utterback, J. (1994). Dominant Designs and the Survival of Firms 2438BC. In *Mastering the Dynamics of Innovation* (pp. 23-56). Boston: Harvard Business School Press.

APPENDIX

APPENDIX 1
SCHLUMBERGER, A GLOBAL ORGANIZATION



Source: 2018 Global stewardship report (SLB, 2019, p. 3)

APPENDIX 2
KNOWLEDGE SHARING FACTS

Knowledge Sharing	
Number of Times Employee CVs Are Viewed	7,600,000
Number of Times Employees Have Viewed Database Info	7,700,000
Total Number of Objects in Knowledge Base	2,200,000
Number of Entries in Corporate Encyclopedia	30,000
Total Number of Times Encyclopedia Has Been Accessed	15,000,000
Total Downloads of Technical Articles	138,000
Employees Involved in Forums, Newsletters and Workshops	33,000
Number of Live Webinar Viewers	28,500
Number of Webinars Downloaded	62,000
Number of Webinars	620
Number of Bulletin Board Questions and Answers	254,000

Source: 2018 Global stewardship report (SLB, 2019, p. 61)

APPENDIX 3
INTERNAL R&D DEVELOPMENT BREAKTHROUGHS

Historical Highlights

1878
Conrad Schlumberger is born

1884
Marcel Schlumberger is born

1926
Société de Prospection Électrique, the precursor to Schlumberger, is created

1927
First electrical resistivity well log in Pechelbronn, France, is performed

1929
First well logs in the United States and the Soviet Union are performed

1930
Electrical logging is first used to locate oil

Spontaneous potential (SP) is discovered

1941
First well log in Saudi Arabia is performed

1945
First well log in Brazil is performed

1946
First well induction log is recorded in Texas

1948
Schlumberger research center in Ridgefield, Connecticut, is established

Microlog® tool is introduced

1950
Laterolog® system is introduced

1951
First experiments with the microneutron device are performed to measure formation porosity

1952
50% of Forex and Languedocienne drilling companies is acquired

1956
Johnston Testers is acquired

Schlumberger Limited is established as holding company for all Schlumberger businesses

Pierre Schlumberger (Marcel's son) becomes the first president of Schlumberger Limited

1959
First Schlumberger engineering center is established in Clamart, France

1960
Dowell Schlumberger joint venture is established with Dow Chemical

1962
Schlumberger is listed on the New York Stock Exchange with the ticker symbol SLB

1964
Neptune Drilling Company is created by merging some Languedocienne operations with Forex

1965
Jean Riboud is appointed CEO

1966
First well log in Norway is performed

1970
SARABAND computerized reservoir analysis program is introduced

1971
Flopetrol, a production testing services company, is acquired

Forex Neptune drilling company is formed

"Triple-combo" logging tool is introduced

1976
First Schlumberger computer-equipped well logging truck is introduced

1978
SDT tool, the first-generation digital sonic tool, is developed

1980
First measurement-while-drilling (MWD) operation is performed in the Gulf of Mexico

First well log in China is performed

1982
Schlumberger Cambridge Research facility is established in the United Kingdom

1984
SEDCO, a drilling rig company, is acquired

Anadrill is established by merging drilling segments from Dowell and The Analysts

Nuclear magnetic resonance petrophysics research is started

1985
Michel Vaillaud is appointed CEO

SEDCO Forex drilling company is formed

50% of GECO, an offshore seismic services company in Norway, is acquired

Schlumberger engineering center in Fuchinobe, Japan, is established

Private and internal Schlumberger Information Network (SINet) is established

1986
Euan Baird is appointed chairman and CEO

1988
Remaining 50% of GECO is acquired

1989
First logging-while-drilling (LWD) tool is introduced

MAXIS 500* wellsite surface instrumentation is introduced

MDT* modular formation dynamics tester is commercialized

1991
PRAKLA SEISMOS is acquired and Geco-Prakla is formed

Geosteering is first used to plan the drilling path in horizontal wells

FMI* fullbore formation microimager is introduced

1992
GeoQuest Systems Inc., a provider of geoscience workstations, is acquired

1995
Omnes joint venture with Cable & Wireless is formed

Petroleum division of Intera Information Technologies Corporation is acquired, including its ECLIPSE reservoir study team and reservoir technologies

Platform Express* integrated wireline logging tool is introduced

Integrated Project Management (IPM) is launched as an independent service and engineering group

1996
Oilphase, a reservoir sampling and analysis company, is acquired

1997
ClearFRAC* polymer-free fracturing fluids are introduced

1998
Camco International, a completions company, is acquired, including REDA, a manufacturer of electric submersible pumps

PowerDrive* rotary steerable system is introduced

1999
Schlumberger Stavanger Research Center is established in Norway

2000
WesternGeco joint venture is created with Baker Hughes

IndigoPool.com, an acquisition and development services company, is launched

Offshore surveys with the Q-Marine* point-receiver marine seismic system are started

2001
Sensa fiber-optic temperature sensing solutions is acquired

Phoenix, a submersible pump technology company, is acquired

Schlumberger Information Solutions (SIS) is formed

Source: SLB History book (SLB, 2017, p. 167)

2002
Inside Reality, a 3D virtual reality system, is acquired

DBR Group, a provider of phase behavior and fluid property technology, is acquired

OrientXact* tubing-conveyed oriented perforating system is introduced

FlexSTONE* advanced flexible cementing technology is introduced

2003
Andrew Gould is appointed chairman and CEO

Petrel Workflow Tools, a provider of collaborative software for seismic imaging, is acquired

Voxel Vision, a PC-based visualization and seismic technology company, is acquired

2004
Russia Technology Hub is established on the Gubkin Russian State University campus

AOA Geomarine Operations, provider of controlled-source electromagnetic and marine magnetotelluric technologies, is acquired

Stake in PetroAlliance is acquired

sonicVISION* sonic-while-drilling service is introduced

2005
Scope* MLWD services for measurement and logging while drilling is introduced

Scanner* rock and fluid characterization services is introduced

2006
TerraTek, a provider of geomechanics measurements and analysis, is acquired

Siberian Geophysical Company is acquired

Reslink, an advanced completion solutions company, is acquired

Full ownership of WesternGeco is acquired

Schlumberger Dhahran Center for Carbonate Research is established in Saudi Arabia

2007
Tyumenpromgeofizika, a geophysical and wireline logging company, is acquired

Insensys fiber optic stress measurement systems is acquired

Majority stake in Framo Engineering is acquired

InSitu Density* reservoir fluid density and viscosity sensors are introduced

2008
Extreme Engineering Limited, a provider of remote measurement-while-drilling systems, is acquired

Integrated Exploration Systems, a provider of petroleum systems modeling software and services, is acquired

WellWatcher Flux* multizonal reservoir monitoring system is introduced

2009
Techsia, a provider of petrophysical software, is acquired

INTERSECT* high-resolution reservoir simulator, a joint product collaboration of Schlumberger, Chevron, and Total, is introduced

2010
Brazil Research and Geoengineering Center is established in Rio de Janeiro

Smith International, including M-I SWACO, is acquired

Geoservices, a provider of mud logging, slickline, and production surveillance operations, is acquired

GeothermEx Inc., a provider of geothermal consulting services, is acquired

HiWAY* flow-channel fracturing technique is introduced

2011
Paal Kibsgaard is appointed CEO

Full ownership of Framo Engineering is assumed

ThruBit, a provider of openhole logging services, is acquired

Dual Coil Shooting* multivessel full-azimuth acquisition is introduced

Avocet* production operations software platform is released

ENVIROTHERM NT* chrome-free water-base drilling fluid system is introduced

Schlumberger Production Management (SPM) is launched to help develop and comanage customer assets under long-term agreements

2012
IsoMetrix* marine isometric seismic technology is introduced

SPARK* technology delivery platform is introduced

MicroScope* resistivity- and imaging-while drilling service is introduced

OneSubsea joint venture is formed with Cameron International

2013
ONYX 360* rolling PDC cutter is introduced

Vx Spectra* surface multiphase flowmeter is introduced

2014
SES Holdings Limited, a provider of international land drilling services, is acquired

MS Recon* high-fidelity microseismic surface acquisition system is introduced

Quanta Geo* photorealistic reservoir geology service is introduced

GeoSphere* reservoir mapping-while-drilling service is introduced

BroadBand Sequence* fracturing service is introduced

StingBlade* conical diamond element bit with Stinger* conical diamond elements is introduced

2015
Paal Kibsgaard is appointed chairman

Novatek, a company specializing in synthetic diamond technology, is acquired

Fluid Inclusion Technologies Inc., a company specializing in analysis of trapped fluids in rock material and advanced borehole gas analysis, is acquired

Infinity* dissolvable plug-and-perf system is introduced

SCREEN PULSE* fluid and cuttings separator is introduced

T&T Engineering Services, a provider of land rig design, is acquired

2016
OneLNG℠ joint venture is formed with Golar LNG Limited

Cameron International, a provider of wellhead and surface equipment and flow control and processing technology, is acquired

Omron Oilfield and Marine, a provider of automation technology and solutions, is acquired

Saltel Industries, an engineering, manufacturing, and service company offering expandable patches and steel packers technology, is acquired

Manara* production and reservoir management system is introduced

Maze* microfluidic SARA analysis technology, an industry first, is introduced

2017
SpectraSphere* fluid mapping-while-drilling service is introduced

Lift IQ* production life cycle management service is introduced

Expands OneStim operations in North America land by 1 million hydraulic horsepower

DELFI* cognitive E&P environment is introduced

DrillPlan* coherent well construction planning solution is introduced

Source: SLB History book (SLB, 2017, p. 168)

APPENDIX 4
GROWTH THROUGH STRATEGIC ACQUISITIONS

Growth Through Strategic Acquisitions

Oilfield technology growth at Schlumberger was fueled by the acquisition of enterprises large and small, some of which had expertise in niche markets.

1952
Acquires 50% of the French drilling companies Forex (Forage et Exploitations Pétrolières) and Languedocienne (Société languedocienne de forages pétroliers).

1956
Acquires Johnston Testers, a Houston-based well testing company.

1960
Establishes Dowell Schlumberger, a joint venture with Dow Chemical specializing in oil well completion services such as fracturing, acidizing, and cementing.

1964
Creates the Neptune Drilling Company by merging parts of its Languedocienne operations with Forex.

1971
Acquires the remaining 50% of Forex and creates Forex Neptune drilling company. Acquires Flopetrol, a French company specializing in production testing services.

1977
Acquires The Analysts, a Houston-based company that provided directional drilling and mud logging services.

1984
Acquires SEDCO, a drilling rig company based in Dallas, Texas.

1985
Merges SEDCO with Forex Neptune drilling company to create the SEDCO Forex drilling company. Acquires 50% of the Norwegian firm GECO, which specialized in offshore seismic services.

1991
Acquires PRAKLA SEISMOS, a German geophysical company, and merges it with GECO to create Geco-Prakla.

1992
Acquires GeoQuest Systems Inc., a leader in the fast-growing geoscience workstation market.

1995
Acquires the petroleum division of Intera Information Technologies Corporation, including its ECLIPSE reservoir study team and reservoir technologies. ECLIPSE was the leading supplier of reservoir simulation software.

1998
Acquires Camco International, a Houston-based completions services company. The acquisition included REDA, the world's largest manufacturer of electric submersible pumps.

1999
Enters joint venture with Smith International, creating the world's largest drilling fluids company, M-I LLC. In 2004, M-I was renamed M-I SWACO.

2000
Combines Geco-Prakla with Baker Hughes's seismic business Western Geophysical, creating the joint venture WesternGeco. Acquires Aberdeen-based Data Marine Systems Limited, an oilfield communications firm.

2001
Acquires Sensa fiber-optic temperature sensing solutions based in Southampton, England.

2003
Acquires Norwegian Petrel Workflow Tools, a provider of collaborative software for the seismic sector.

2006
Acquires the 30% minority interest in WesternGeco held by Baker Hughes. Acquires TerraTek, a Salt Lake City-based provider of geomechanics measurements and analysis.

2009
Acquires Techsia, a supplier of petrophysical software based in Montpellier, France.

2010
Acquires Smith International, a Houston-based company specializing in drilling tools and drilling fluid technologies. Acquires Geoservices, a French company specializing in mud logging, slickline, and production surveillance operations.

2011
Acquires Framo Engineering, a privately owned Norwegian firm producing pumps, metering systems, swivels, and other marine systems for the oil and gas industry.

2015
Acquires Novatek, adding unique diamond technologies for improved drilling performance.

2016
Acquires Cameron International, a Houston-based leading provider of flow equipment products, systems, and services.

Source: SLB History book (SLB, 2017, p. 40)

APPENDIX 5
ADVERTISING IN INDUSTRY JOURNAL

The well logging truck shown in this 1937 *Petroleum World* advertisement for the California division of Schlumberger Well Surveying Corporation was the first completely enclosed model and was considered to be quite flashy for this time period.

Source: SLB History book (SLB, 2017, p. 74)

APPENDIX 6
EXAMPLES OF CONTRIBUTIONS OF SLB TECHNOLOGIES TO GLOBAL STEWARDSHIP

TECHNOLOGY	BENEFIT								
	Biodiversity	Decreases Air Emissions	Reduces Water Use	Recycle/Reduces Waste	Reduces Footprint/Land Use	Reduces Transportation	Cleaner Chemistry	More Efficient (Saves Time)	Reduces Risk
GyroSphere MEMS Gyro-While-Drilling Service		●						●	
Torrential High-Flow Filtration Unit		●		●				●	●
FUTUR Self-Healing Cement System									●
Fulcrum Cement-Conveyed Frac Performance Technology		●						●	●
Broadband Precision Integrated Completion Service		●						●	
Manara Production and Reservoir Management System		●			●	●			
Viscous Slickwater		●	●		●	●	●	●	●
EverGreen Minimal Environmental Impact Well Effluent Burner	●	●							
LiftIQ Production Life Cycle Management Service		●				●			●
ORBIT Low-E Certified Low Emissions Valve		●							●
Apura Gas-Separation Membranes		●					●		
Concert Well Testing Live Performance								●	●

Source: 2018 Global Stewardship report (SLB, 2019, p. 23).

APPENDIX 7
KEY FACTS ABOUT SLB INVOLVEMENT WITH ACADEMIA

Source: 2018 Global Stewardship report (SLB, 2019, p. 58).