

FRANSEN, RAJA, BOA, PFLUEGER & BASNER

EXPANDING MARKETS THROUGH ANALYTICAL SERVICES AND SOLUTIONS

FEBRUARY 2017

A CASE STUDY OF BRÜEL & KJÆR

CBS  COPENHAGEN
BUSINESS SCHOOL

CBS 
COMPETITIVENESS
PLATFORM

**INDUSTRIENS
FOND** FREMMER DANSK
KONKURRENCEVNE
The Danish Industry Foundation

INTRODUCTION

In this report, we consider the case of Brüel & Kjær Sound & Vibration Measurement A/S and how it has sought to successfully develop highly complex analytical services and solutions alongside solution-based business models. This short case study explores the opportunities

and challenges encountered by the company in seeking to scale up these developments to certain areas of its business.

The key strategic considerations and challenges addressed in this report include:

- **WHAT IT TAKES TO BE A GLOBAL MARKET LEADER**
- **MOVING INTO THE PRODUCTION LINES OF CUSTOMERS AND THE IMPLICATIONS FOR PERFORMANCE OBJECTIVES**
- **COMMERCIALIZING ACCRUED KNOWLEDGE OF COMPLEX ENGINEERING SERVICES**
- **MOVING FROM PRODUCTS TO SERVICES AND SOLUTIONS THROUGH BUSINESS MODEL INNOVATION**

RESEARCH BACKGROUND

This report stems from research undertaken by Copenhagen Business School (CBS) as part of the applied research project 'Driving Competitiveness through Servitization'.

The aim of the project is to examine the potential of services as a means of improving the competitiveness of Danish industry. The project is supported by the Danish Industry Foundation and involves close collaboration with Danish companies.

Further information about the project is available at blog.cbs.dk/servitization

COMPANY BACKGROUND

Brüel & Kjær is a Danish multinational high-tech company producing sound and vibration measurement hardware and software and offering solutions for noise monitoring to customers around the world. Founded in 1942 by Per Brüel and Viggo Kjær, the company is known for delivering high quality premium priced products, as well as for its reliability and trustworthiness. Its high precision measurement instruments and solutions are key in responding

to the challenges encountered in noise monitoring by both industry and governmental bodies. The range of application of the company's products is wide: they are used in traffic and airport noise monitoring; machine diagnostics; to ensure cabin comfort in passenger airplanes and cars; in production quality control; and to facilitate wind turbine noise monitoring. For the first fifty years, Brüel & Kjær was run by the

founders and their families. In 1992, the company was acquired by the English company listed on the London Stock Exchange, known today as Spectris plc. This move was accompanied by an increased internal focus on financial deliverables.

ABOUT BRÜEL & KJÆR



Headquarters
NÆRUM - DK

Est.

Founded
1942



Revenue (2015)
1.053 MDKK



Profit (2015)
162.0 MDKK



Employees (2015)
478



Products

**SOUND AND
VIBRATION
MEASUREMENT
EQUIPMENT**



Services

**INSTALLATION,
HARDWARE
MAINTENANCE,
ENGINEERING
SERVICES,
CALIBRATION AND
SOFTWARE ~ 21 %
OF REVENUE**



Locations

**EUROPE,
NORTH AMERICA
AND ASIA**

BEING A GLOBAL MARKET LEADER

Brüel & Kjær has a distinct history of introducing innovative products to the market. With its strong research and development (R&D) capabilities, the company has, over the years, created a powerful culture of innovation.

In developing the world's first charge accelerometer, measurement microphones and sound level meters, Brüel & Kjær independently invented the field of sound and vibration measurement. In 2017, it continues to be a key player in sound and vibration monitoring equipment.

Sound and vibration measurement instruments are used in most industries, including the automotive industry and transportation, aerospace, defence, airport environments, urban environments, telecom and audio. Traditionally, customers have used Brüel & Kjær's equipment in their R&D activities to ensure that their products meet the required standards. In most cases, the measurements taken by Brüel & Kjær's equipment provide the basis for critical design decisions and, as a result, are highly important to customers.

Measurements from Brüel & Kjær's instruments often impact the assessment of crucial product features, which, in turn, can significantly influence aspects such as equipment performance and/or safety. High noise levels also often have a substantial impact on market potentials. By way of example, within the specific field of noise monitoring solutions, measurements can have direct financial consequences, with the possibility of severe penalties if planes violate official noise limits.

Brüel & Kjær continuously strives to expand to new markets in North America and Asia, where it has experienced significant growth. This has been important for Brüel & Kjær, given the slow progression in the noise and vibration test equipment market in Europe experienced in recent times. The development by competitors of lower cost and lower quality

equipment appears to be the primary driver behind the limited overall growth, and growth potential in the European market. Consequently, Brüel & Kjær is facing commoditisation (the process through which a company's goods become relatively indistinguishable from competing products) and has sought to develop new strategic directions in order to counter these emerging trends. Whilst high quality equipment provides Brüel & Kjær with a competitive edge when offering hardware to customers, faced with increasing pressure on pricing and growing complexity in their use of test equipment, the company is finding new ways to differentiate itself and add value to its traditional product offerings, in order to maintain its position as market leader.

“COMPETITORS WOULD MOST OFTEN JUST PRODUCE MICROPHONES OR ACCELEROMETERS, OR THE MEASUREMENT BOXES, OR THE SOFTWARE. SO THEY HAVE PARTS OF THE CHAIN, WHERE WE HAVE IT ALL.”

JENS KARASAWA CHRISTENSEN, GLOBAL SOLUTIONS AND SUPPORT DIRECTOR

MOVING BEYOND R&D AND INTO PRODUCTION LINES

Making the move

In response to customer needs, Brüel & Kjær is currently expanding beyond its traditional assistance in the design and development of customer products to other areas of their business.

This shift has involved an enhanced focus on customers' manufacturing and operations, as well as a desire to engage with production line employees and drive processes within the customer organisations. The shift in focus has resulted in greater attention to the sale of products and engineering services to customers operating production machinery and an increased emphasis on closer customer relationships and sales of future services. The transition towards a more integrated role in customer operations and processes aligns with the overall company strategy of expanding markets, as well as its intention of securing resilient revenue in the longer term.

Implications for performance objectives

The high precision equipment and in-depth knowledge obtained through

sound and vibration analysis has the potential to strengthen customer operations. However, those positive attributes have several implications for Brüel & Kjær's operational performance objectives.

The operational performance objectives of a company support its strategy. They are considered to be the means of achieving the company's goals and typically consist of a configuration of speed, flexibility, dependability, cost effectiveness and quality. Previously, when Brüel & Kjær's products predominantly targeted customer R&D functions, the performance objectives of product sophistication and dependability were most heavily weighted.

This emphasis stemmed from customers' high expectations and their detailed requirements for the quality and accuracy of measurement equipment. In this context, timeliness is less important and the higher price of the product is not questioned, given that Brüel & Kjær's products were considered to be the premium

brand within the sound and vibration measurement industry.

Refocusing performance objectives for a new terrain

The move into customer product lines has, however, brought with it the need to refocus operational objectives and a resulting increased emphasis on timeliness and cost effectiveness. This transition in objectives is due to Brüel & Kjær's equipment being integral to production lines, which are often run on tight budgets and with no time to accommodate faults or malfunctions. The internal implications of this shift were significant and have led to an increased focus on processes in order to deliver the desired products and services in a timely manner.

As a result, Brüel & Kjær's five performance objectives (outlined above) vary for the different contexts of products and services aimed at (i) R&D customers and (ii) production line customers.

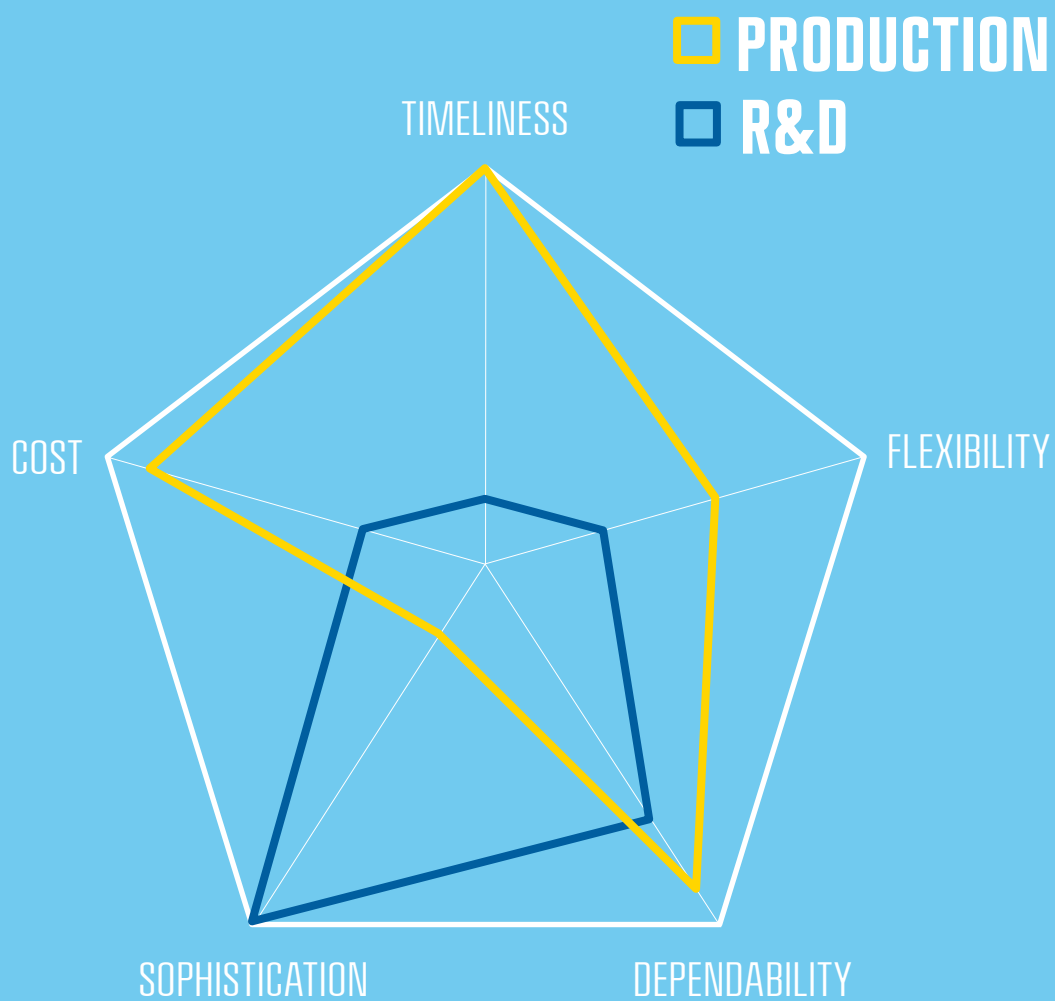


Figure 1 - Key Performance Objectives of Customers

The figure above shows the five performance objectives in a polar diagram for the two contexts. The blue line depicts the performance objectives for R&D noise measurement equipment, while the yellow line depicts the performance objectives for equipment used in production lines.

Key capability: managing the entire measurement value chain

Key differentiators for Brüel & Kjær are its global operations and extensive

product range. These give Brüel & Kjær a competitive advantage as the company is able to provide an integrated solution to its customers across the entire measurement chain and a full array of hardware, software and analysis capabilities. In order to retain that competitive advantage, it is crucial for the company to have, and maintain, the necessary capabilities to offer turnkey solutions for its customers as a 'one-stop-shop'. Brüel & Kjær's services support the many inter-related

processes of the measurement chain. This contributes to the company's strategic goal of making its revenue more resilient. It generates steadier income for Brüel & Kjær, rather than occasional and ad-hoc payments from, for example, one-off equipment sales and the occasional calibration service.

COMMERCIALIZING KNOWLEDGE AND PROVIDING ENGINEERING SERVICES

Alongside its intention to be the sole port of call for its customers, Brüel & Kjær is increasingly shifting its focus towards using its capabilities and sophisticated knowledge to offer solutions to specific customer challenges. Brüel & Kjær's competencies are sought by customers who are increasingly aware of the importance of expert knowledge in the intricacies of sound and vibration measurement. Brüel & Kjær has the requisite capabilities to assist customers – who face challenges in acquiring, analysing and interpreting sound and vibration measurement data – to understand and solve complex engineering issues pertaining to optimisation. For instance, some solution projects have included troubleshooting noise and vibration, mitigating their causes and paths, performing quality assurance evaluations and providing new products, as well as testing production line quality.

Brüel & Kjær's PULSE platform

Many of Brüel & Kjær's customers require an array of tests to be performed on their equipment. By

using Brüel & Kjær's PULSE systems, customers are able to gather extensive amounts of data through testing equipment in different operational conditions, under different pressures or in different environments. This can result in an extremely large pool of data, which the customer then needs to manage.

Recognising this, Brüel & Kjær has developed its PULSE platform, a data acquisition and analysis system designed to manage, analyse and deliver data-driven reports to the customer. The system is intended to be intuitive and application-specific and allow for automated measurements without the help of a programmer, making it easier and faster for customers to navigate and analyse the data collected from their Brüel & Kjær equipment.

Providing assurance and accreditation of measurement equipment

Brüel & Kjær also draws on its specialised knowledge in calibration. Since 1991, it has operated the Danish Primary Laboratory of Acoustics (DPLA), in association with a Danish technical

university and by commission of the Danish government. Among other responsibilities, the DPLA calibrates reference instruments for other calibration laboratories. In this sense, Brüel & Kjær operates on the premise of not interfering with the business of its customers, but rather providing the assurance and accreditation that their instruments measure correctly.

Over time, Brüel & Kjær has accumulated significant reputational capital, which is reflected in the trust customers place in its capabilities and the precision of its instruments.

But how does a company with 70 years of experience then turn toward recognising services and solutions in its daily life? Simply put, services require ongoing effort and change.

OPERATIONS STRATEGY

INSPIRED TO EVOLVE

The company's founders were, and continue to be, seen as visionaries and to inspire employees. They were innovators and prioritised quality. Under their watch, products were released only when perfect. This legacy has stayed with the company and its workforce and the strong sense of pride at being part of Brüel & Kjær is evident. Yet, with this traditional emphasis on product quality, how is it possible to offer the best services and solutions?

From product innovation to addressing actual customer needs

Brüel & Kjær has not always been as enthusiastic in its pursuit of services and solutions as it is today. For 70 years, it has calibrated and repaired equipment, while also excelling in developing and producing hardware and software for measuring sound and vibrations. Employees have been, and continue to be, excellent in innovating and dealing with equipment, with many having studied and researched engineering acoustics at the technical university and then, usually within Brüel & Kjær's R&D division, developed new technologies for helping improving customer performance.

However, over time and as a result of internal developments and external influences, Brüel & Kjær has shifted towards being more market oriented and increasingly address customer needs. This change of focus has affected how those working at Brüel & Kjær think about and approach their roles. Listening to customers attentively and changing internal mind-sets has proved challenging. However, gradually, more solution-oriented thinking has emerged. The company recognises that producing the most sophisticated equipment in the world is not enough if customers do not have an actual need or use for it, as it will not be sold. Understanding customer pain points and finding the right solutions is, at present, part of the daily life of a Brüel & Kjær employee.

In addition, and in light of the global economic crises and the resultant impacts on customers, Brüel & Kjær has recognised the need to be more resilient, and the company considers introducing related services to be the way in which to ensure this. A new team has been established within Brüel & Kjær to accelerate towards the provision of services and solutions, or 'servitization'.

“‘WORLD CLASS SERVICE’ IS CONCERNED WITH THE NATURAL DELIVERY OF EXACTLY THAT – WORLD CLASS SERVICE – ACROSS ALL MARKETS AND GEOGRAPHICAL BORDERS. FOR THIS PURPOSE, BRÜEL & KJÆR HAS ACKNOWLEDGED THE NEED TO ACQUIRE AND ENGAGE RESOURCES TO FACILITATE DELIVERY AND HAS INVESTED IN SERVICE PROFESSIONALS, AS WELL AS CROSS-FUNCTIONAL WORKING GROUPS, TO PUSH THE SERVICE INITIATIVES.”

CLAUS BLAABJERG,
INNOVATION MANAGER

Acquiring a new service business model

Since 1966, Brüel & Kjær has offered Airport Noise Monitoring Systems. However, until recently, the airports at which that equipment is installed were themselves responsible for its operation.

The Australian company, Lochard Ltd (Lochard), understood that noise monitoring is often a non-core business activity of an airport. Rather, it is an important requirement mandated by law with strict regulatory requirements that, if not monitored and reported, can lead to penalties. Noise monitoring requires airports to provide reports and therefore creates the need to invest in the necessary equipment and employ personnel capable of both operating the equipment and analyzing the resulting data. Lochard developed a new value proposition for airport authorities: install the noise measurement equipment,

operate it for the customer and provide the needed reports, in exchange for a subscription fee.

This new operating expenditure-oriented business model was an eye opener for Brüel & Kjær. In 2009, the company acquired Lochard, which had been its primary competitor in the airport noise monitoring market for some time. During that competitive period, Brüel & Kjær struggled to retain or retrieve customers, as Lochard enjoyed greater access to customer organizations and benefited from a very high customer retention rate. Brüel & Kjær saw potential in Lochard's business model and the value it proposed. The acquisition also had the added benefit of facilitating a change in employee mind-set showing that new ways of operating were possible beyond simply selling hardware and software.

In acquiring Lochard, Brüel & Kjær combined the best of two worlds – measuring sound using its own Brüel & Kjær-branded sophisticated analytical instruments, whilst adding Lochard's service-focused capability to its repertoire. The acquisition was seen as a good synergy between the two companies as it provided the basis for Brüel & Kjær to introduce its equipment to the provision of environmental monitoring solutions in new markets.

Inspired by Lochard's former business model, Brüel & Kjær has developed the "World Class Service" initiative. This entails being able to deliver service in every aspect to the customer to meet their needs, from addressing issues with instrumentation, to providing training and engineering services. For Brüel & Kjær, it is truly considered an integral part of the business in the future.

“THE BUSINESS MODEL OF LOCHARD WAS MUCH BETTER THAN OUR, MORE TRADITIONAL APPROACH. IT WAS MUCH MORE INTERESTING FOR THE CUSTOMER BECAUSE, BASICALLY, IF YOU TAKE AN AIRPORT, THEIR BUSINESS IS GETTING AIRCRAFT IN AND OUT, AND PASSENGERS ON/OFF, THEY DON'T REALLY WANT TO DO SOUND MEASUREMENTS. THAT'S JUST AN ANNOYANCE, BASED ON THE LOCAL REGULATION, SO THEY WERE HAPPY TO FARM THIS OUT TO SOMEBODY ELSE.”

JENS KARASAWA CHRISTENSEN, GLOBAL SOLUTIONS AND SUPPORT DIRECTOR

AN EXAMPLE

AIRPORT NOISE MANAGEMENT EVOLUTION

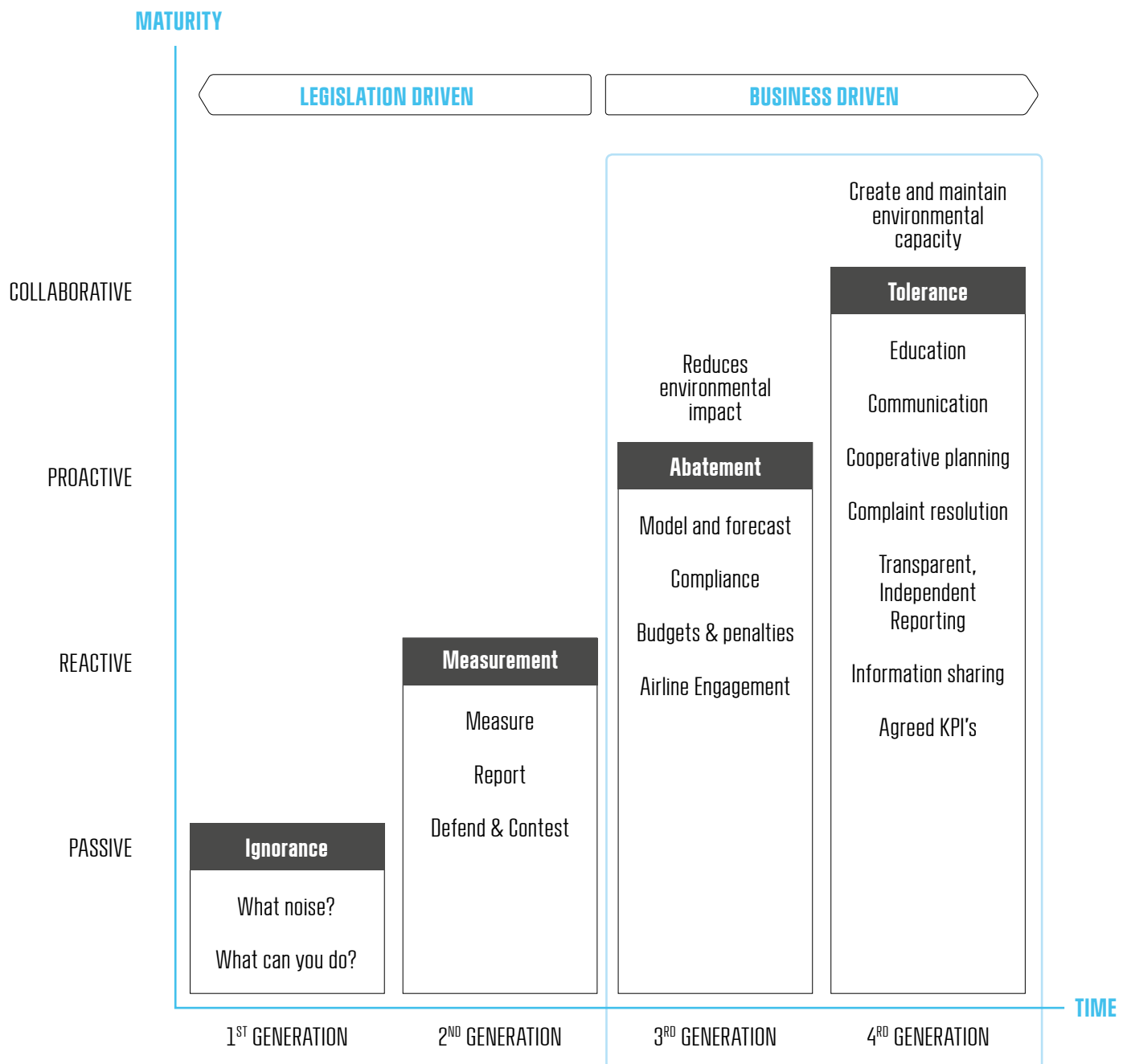
Brüel & Kjær's activities in the airport noise measurement market reflect the changing demand within that industry. Previously, airports were not really concerned about monitoring noise, as sound pollution was not subject to international regulation. In recent times, however, and as the number of airports has grown, attention has turned towards measuring the impact of noise on both the environment and the surrounding population, causing governing bodies to become increasingly important stakeholders for

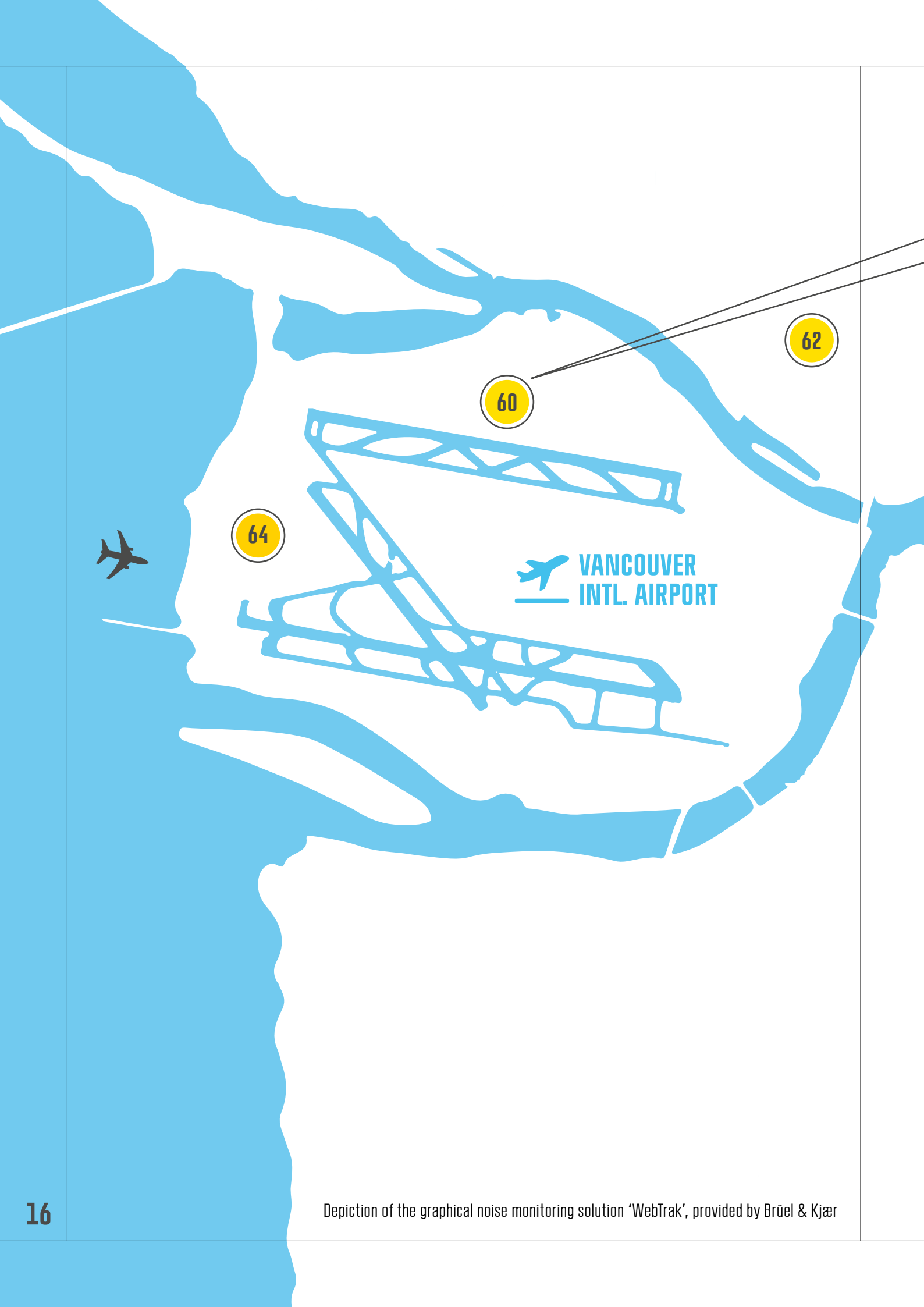
airports, alongside environmental and social campaigners, local residents and politicians. This poses a challenge for many airports, whose main business purpose is to handle aircrafts, luggage and passengers. Engagement in stakeholder management presents an unwanted, non-value adding activity for airports.

Brüel & Kjær identified the potential to solve this predicament. Supporting airports in their noise management could be designed to add value to their

customers. All in all, Brüel & Kjær has witnessed the changes in airport noise management across four generations and highlights that the third and fourth generation airports (as shown in the diagram on the following page) are driven by good business practices, rather than legislative requirements. The trend is unidirectional, although not all customers across the world are at the same stage at the time of writing.

AIRPORT NOISE MANAGEMENT EVOLUTION







NORTH SEA ISLAND, LEQ: 60DB



DIGGING DEEPER

THE SPECIFIC CASE OF ENVIRONMENTAL NOISE AND VIBRATION

Brüel & Kjær has at its disposal the tools necessary to monitor the environmental impact of aircraft movement on a surrounding community, as well as the capabilities to issue reports directly to authorities and airlines on behalf of the airports. These capabilities and tools were acquired with Lochard, which was offering packaged solutions to customers based on those capacities.

WebTrak is a subscription service, used by more than 200 airports around the world, which displays noise and vibration data 24 hours a day. It allows airports, authorities

and the general public to access data online in historic mode. The software displays information to the public in an engaging way, which in turn reduces the resources necessary for mandatory reporting and enables valuable dialogues to be held with key stakeholders.

Brüel & Kjær successfully integrated Lochard into its operations through the deliberate creation of a new business unit dedicated to Environmental Management Solutions, through which the WebTrak solution is provided.

THE FUTURE

BRÜEL & KJÆR GOING FORWARD

Moving towards the future, Brüel & Kjær is seeking to become a greater part of the service economy, to secure future revenue and strategically position itself to meet customer needs. With new services and solutions, Brüel & Kjær is well placed to ensure its customers are always satisfied and are provided with the most

accurate results from its hardware and software. Highly skilled technicians and engineers calibrate the equipment and maximise uptime, so that customers can trust the results of their sound and vibration measurements. Services are vital in ensuring that the company grows and overcomes the challenges of commoditisation. By commercialising

a vast amassed knowledge, staying alert to new opportunities, providing engineering services to meet customer needs and drawing inspiration through acquisition to develop new solution-based business models, Brüel & Kjær continues to evolve and innovate.



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Spectris plc 2016 Interim Results, dated 28 July 2016

SERVITIZATION RESEARCH AT CBS

CBS is undertaking a research project to examine the potential of services as a means of improving competitiveness for Danish industry. The project is supported by the Danish Industry Foundation and involves working closely with industry.

For more information, see: cbs.dk/competitiveness and blog.cbs.dk/servitization

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