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Fostering innovation through Big Science procurement

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This is part of ATTRACT that has received funding from the European Union's Horizon 2020 Research and Innovation Programme under grant agreement No. 101004462.

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Submitted to the Wilhelm Büchner University 2020
Faculty of Industrial Engineering and Technology management for the Master of Business Administration to Professor Dr. Ralf Isenmann
Revised and updated for publication in 2024

Imprint

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1st edition, 2024 | Steinbeis-Edition, Stuttgart
ISBN 978-3-95663-303-4 | This book is also available as an e-book: ISBN 978-3-95663-304-1
Likewise Wilhelm Büchner University, master's thesis 2020

Layout: Steinbeis-Edition
Cover picture: Sonia Utermann
Publishing house: Steinbeis-Edition | Steinbeis-Stiftung, Adornostraße 8, 70599 Stuttgart
Production: Online-Druck GmbH & Co. KG, Eggertstraße 28, 33100 Paderborn

227912-2024-04 | www.steinbeis-edition.de | edition@steinbeis.de

Abstract

Big Science infrastructures represent a multi-billion Euro business domain that operates at the margins of what is technically possible. In the next five years, the 11 largest Big Science organisations in Europe plan to spend nearly €40 billion on innovative technologies (BSBF, 2022). Big Science has unique needs as well as the expertise to articulate these needs to potential suppliers. As such, Big Science is well positioned to act as a "lead user" (Von Hippel, 1986), driving innovation from the demand side.

This thesis looks at the innovation impact of Big Science procurement based on peer-reviewed studies and emerging best practice. Qualitative measures of innovation impact are presented, as well as the predictors that a Big Science procurement will result in a positive innovation outcome. The most important mechanisms by which Big Science can foster innovation through procurement are identified: articulating need, engaging with the market early, nurturing relationships, sharing knowledge, providing a consolidated market and mitigating development risk. Emerging best practice on how to exploit these mechanisms is presented. Finally, a roadmap for a comprehensive innovation impact study is presented, along with a critical tool for increasing the innovation impact of Big Science procurement: the Big Science Business Forum.

Contents

Introduction

What is matter? Where did it come from? Some of the most fundamental questions that occupy human enquiry are addressed by Big Science: gargantuan pieces of scientific infrastructure that capture the imagination and defy belief; infrastructure like the accelerator complex at the European Laboratory for Particle Physics, CERN (figure 1).

Figure 1: The circle represents the Large Hadron Collider (LHC), one of the most complex and ambitious scientific experiment yet built. It has a circumference of some 26 km. The proposed Future Circular Collider at CERN, if built, will have a circumference of 100 km. Image by Maximilien Brice (CERN) – CERN Document Server, CC BY-SA 3.0, https://commons.wikimedia.org/w/index.php?curid=29027732.

How can we put a price on knowledge? In the scientific spirit, "the only legitimate yardstick for measuring the importance of a basic-science project is its impact on science itself" (Giudice, 2012). Nevertheless, Big Science projects like the proposed future Circular Collider (FCC) at CERN consume intellectual and financial resources to such a degree that it is reasonable – perhaps even imperative – to justify their existence in terms beyond the creation of mere knowledge. Gastrow and Oppelt warn of the "virtuous circle of capa-

Big Science infrastructures represent a multi-billion Euro business domain that operates at the margins of what is technically possible. In the next five years, the 11 largest Big Science organisations in Europe plan to spend nearly €40 billion on innovative technologies. Big Science has unique needs as well as the expertise to articulate these needs to industry. As such, Big Science is well positioned to drive innovation from the demand side. This book examines how this position can be exploited to multiply the innovation impact of Big Science beyond the standard mechanisms of technology transfer.

Qualitative measures of innovation impact are presented, as well as the predictors that a Big Science procurement will result in a positive innovation outcome. The most important mechanisms by which Big Science can foster innovation through procurement are identified: articulating need, engaging with the market early, nurturing relationships, sharing knowledge, providing a consolidated market and mitigating development risk.

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ISBN 978-3-95663-303-4

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