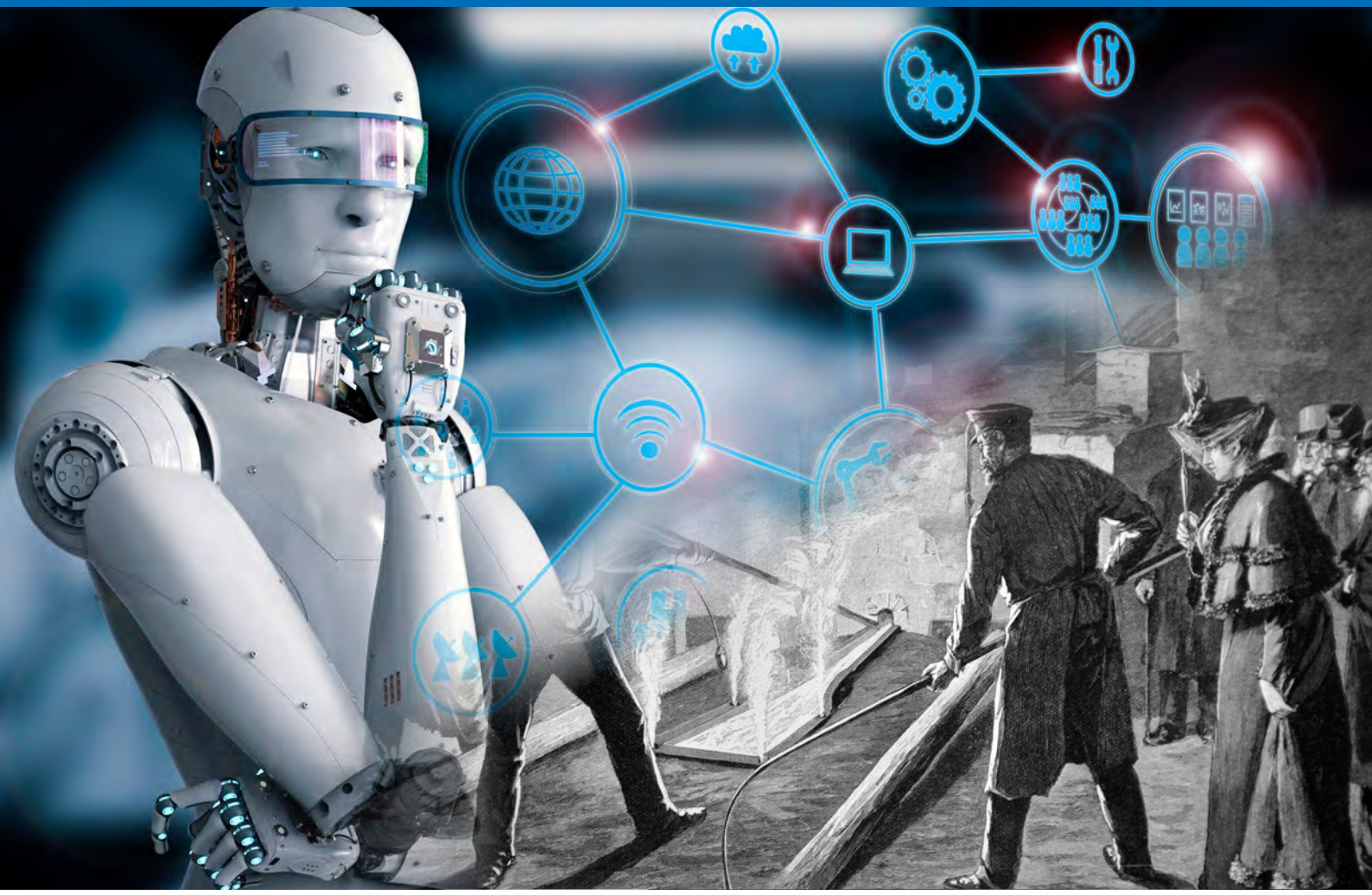
PAS 1040:2019

Digital readiness – Adopting digital technologies in manufacturing – Guide



Innovate UK

bsi.

Publishing and copyright information

The BSI copyright notice displayed in this document indicates when the document was last issued.

© The British Standards Institution 2019.

Published by BSI Standards Limited 2019.

ISBN 978 0 539 035407

ICS 25.040.01; 35.240.50

No copying without BSI permission except as permitted by copyright law.

Publication history

First published August 2019

Contents

Foreword ii

Introduction iii

1 Scope 1

2 Normative references 2

3 Terms and definitions 2

4 Getting ready for digital transformation 3

5 Measuring digital readiness 8

6 Selecting digital readiness diagnostic tools 11

7 Using digital readiness diagnostic tools 13

Annexes

Annex A (informative) Digital readiness diagnostic tools 15

Bibliography 16

List of tables

Table 1 – Industrial digital technologies, technical enablers and business benefits iii

Table 2 – Characteristics of digital readiness in aspects of manufacturing 3

Table 3 – Evidence of getting ready for digital transformation 7

Table 4 – Summary of recommendations for measuring digital readiness 8

Table 5 – Examples of subjective and objective evidence of digital readiness 8

Table 6 – Typical characteristics of digital readiness defined by a nine-point scale 9

Table 7 – Summary of recommendations for selecting digital readiness diagnostic tools 11

Table 8 – Scopes of cross-business and aspect-specific digital readiness diagnostic tools 12

Table 9 – Summary of recommendations for using digital readiness diagnostic tools 13

© The British Standards Institution 2019

Foreword

Publishing information

This PAS (Publicly Available Specification) was sponsored by Innovate UK. Its development was facilitated by BSI Standards Limited, and it was published under licence from The British Standards Institution. It comes into effect on 31 August 2019.

Acknowledgement is given to Dr Steven Barr of EDGE Digital Manufacturing Limited as the technical author, and to the following organizations that were involved in the development of this PAS as members of the steering group:

- Additive Manufacturing UK
- Atlas Copco IAS UK
- EDGE Digital Manufacturing Limited
- HSSMI Limited
- Innovate UK
- Jaguar Land Rover Limited
- The Manufacturing Technology Centre (a High Value Manufacturing Catapult Centre)
- The Society of Motor Manufacturers and Traders Industry Forum
- Vendigital Limited

Acknowledgement is also given to the members of a wider review panel who were consulted in the development of this PAS.

The British Standards Institution retains ownership and copyright of this PAS. BSI Standards Limited as the publisher of the PAS reserves the right to withdraw or amend this PAS on receipt of authoritative advice that it is appropriate to do so. This PAS will be reviewed at intervals not exceeding two years, and any amendments arising from the review will be published as an amended PAS and publicized in *Update Standards*.

This PAS is not to be regarded as a British Standard. It will be withdrawn upon publication of its content in, or as, a British Standard.

The PAS process enables a guide to be rapidly developed in order to fulfil an immediate need in industry. A PAS can be considered for further development as a British Standard, or constitute part of the UK input into the development of a European or International Standard.

Use of this document

As a guide, this PAS takes the form of guidance and recommendations. It should not be quoted as if it were a specification or a code of practice.

Presentational conventions

The guidance in this PAS is presented in roman (i.e. upright) type. Any recommendations are expressed in sentences in which the principal auxiliary verb is "should".

Explanation and general informative material is presented in smaller italic type and does not constitute a normative element.

Where words have alternative spellings, the preferred spelling of the Shorter Oxford English Dictionary is used (e.g. "organization" rather than "organisation").

Contractual and legal considerations

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with this PAS cannot confer immunity from legal obligations.

© The British Standards Institution 2019

0 Introduction

0.1 Information about this document

In addition to broader information about the context and purpose of this document, and further references, this PAS presents guidelines on:

- getting ready for digital transformation: the aspects that manufacturing businesses should consider when planning and implementing digital technologies (Clause **4**);
- measuring digital readiness: how manufacturing businesses should measure their maturity in optimizing their use of digital technologies (Clause **5**);
- selecting digital readiness diagnostic tools: the factors that manufacturing businesses should consider when selecting digital readiness diagnostic tools (Clause **6**);
- using digital readiness diagnostic tools: how manufacturing businesses should use digital readiness diagnostic tools in optimizing their use of digital technologies (Clause **7**).

0.2 Digital transformation of manufacturing

The UK's Industrial Strategy [1] highlights the opportunity for artificial intelligence, automation, data and other digital technologies to transform all stages of the design, manufacture and beneficial use of products. Digitalization needs to permeate the entire supply chain in order to deliver industry-wide productivity gains. And businesses need efficient digital infrastructures to enable connected and secure systems.

The Made Smarter Review 2017 [2] describes the impact of five key industrial digital technologies (IDTs) and offers a list of technical enablers and business benefits, which are set out in Table 1.

More broadly, digital technologies relevant to manufacturing businesses could include other electronic devices or software that use digital information.

Table 1 – Industrial digital technologies, technical enablers and business benefits

Key industrial digital technologies	Business benefits of digital technologies
Additive manufacturing/ 3D printing	Flexibility
Artificial intelligence/ machine learning and data analytics	Productivity
Robotics and automation (including collaborative robots)	Speed
The Industrial Internet of Things and connectivity (including 5G and LPWAN)	Quality
Virtual reality and augmented reality	Scalability
Other technical enablers	Competitiveness and innovative capability
Cloud storage and computing	Robustness
Cybersecurity and blockchain	Cost reduction
Simulation modelling	Sustainability
Digital twin	Safety
Sensors and tracking (including radio-frequency identification and near-field communication)	Working conditions
Digitally-enabled supply chain management	Continuous learning/ collaboration
Enterprise resource planning software	
Manufacturing execution system	
Mobile/ tablet/ watch	

Source: Made Smarter Review 2017 [2]

© The British Standards Institution 2019

0.3 Opportunity

The potential benefits of planned and managed implementation of digital technologies can be substantial. The World Economic Forum's Digital Transformation Initiative estimates "$100 trillion of value that digitalization could create over the next decade" for "digital enterprises" with over 130 initiatives in 12 industries related, directly or indirectly, to manufacturing [3]. The Made Smarter Review estimates that the "positive impact of faster innovation and adoption of IDTs could be as much as £455 billion for UK manufacturing over the next decade" [2].

The extent to which manufacturing businesses step up to claim shares in this substantial prize depends on leadership, informed decision-making and commitment to driving value from investment in digital technologies.

0.4 Challenges

Despite the economic allure of digital technologies, the Made Smarter Review highlights several themes "which are limiting the UK's ability to achieve its potential: [including] poor levels of adoption [of IDTs], particularly among SMEs" [2]. Reasons why manufacturers of any size might be held back include the rapid evolution of digital technologies, and a "confused landscape of business support, with no clear route to access help and ambiguity about what 'good'" looks like" [2].

Adoption of digital technologies might be constrained by factors such as unawareness of their relevance to a business, perceived complexities of integrating them, misconceptions of costs, lack of capability or capacity in the business, poor leadership or narrow strategy. Progress might be slowed or halted altogether by these issues. The process of adoption might never start. Or a business might make poor choices of digital technologies that fail to exploit the opportunities open to it or are not cost-effective.

0.5 Digital readiness level diagnostic tools

The Made Smarter Review recommends a series of actions to achieve an "increased pace of adoption of industrial digital technologies" [2]. These include "creating clear UK standards for digital industries" and the use of "digital readiness level diagnostics" made available in the form of a "national web platform or more in depth diagnostic tools".

In this context, "digital readiness" relates to the maturity of a business in optimizing its use of digital technologies to expand and achieve its organizational, operational, social and financial objectives.

Digital readiness diagnostic tools support progress by formalizing both the measurement of digital readiness and an understanding of the areas a business would need to improve with the help of digital technologies in order to achieve a stronger digital readiness.

Optimization is contextual, relating to the opportunities of a specific business and not necessarily to the sector. A strong digital readiness indicates that the business has chosen the right digital technologies to exploit its opportunities, has implemented them effectively, and is maximizing value in terms of its objectives. A weak digital readiness indicates that action is required to improve business strategy, planning and implementation in order to avoid failure to achieve an adequate return on investment in digital technologies.

0.6 Motivation to invest in digital transformation

The success of suppliers, makers and customers of manufactured goods and services is fundamental to UK economic growth and employment. Together these businesses deliver substantially more than the 11% of gross value added (GVA) and 44% of exports directly attributed to the manufacturing and production industry by the Office for National Statistics [4]. Continuing investment is needed to boost the competitiveness of UK manufacturing.

Digital technologies are enablers for improved productivity and competitiveness. They support collaboration within and between businesses for greater innovation. They engage businesses with customers, enabling mass customization and delivery of tailored services. They protect workers and help in the development of new skills and careers. The future of manufacturing is digital.

0.7 Guidelines for leaders of digital transformation

The guidance in this PAS is intended to inspire any business leader to make progress with digital transformation. The descriptions and examples are written with the needs of suppliers, makers, and customers of manufactured goods and services in mind. This PAS is also of benefit to developers and providers of digital readiness diagnostic tools.

© The British Standards Institution 2019

1 Scope

This PAS provides a standardized methodology for assessing the readiness of a business to adopt digital technologies in manufacturing, and for assessing progress along its digital journey.

Digital readiness, the maturity of a business or part of a business in optimizing its use of digital technologies, can be measured on a scale of 1 to 9. This PAS gives guidance for identifying and understanding the range of potential business factors to be taken into consideration in planning and implementing the digital journey.

This PAS considers a broad range of business factors relevant to assessing the readiness of a business to benefit from digital technologies. These factors include leadership, processes and driving value for the business and its partners, all of which are underpinned by the capabilities of the workforce.

This PAS does not cover:

- how to implement new digital technologies;
- any tool elements;
- recommendations of any specific tools;
- how best to implement digital technologies;
- identifying the business opportunities associated with digital manufacturing; or
- defining the business case for digital manufacturing.

This PAS is intended to be used by UK manufacturers of all sizes including suppliers, makers, and customers of manufactured goods and services. This PAS is not intended to be used directly by end consumers. Additionally, the guidance could be used by other businesses who are looking to increase their business efficiencies and competitiveness.

© The British Standards Institution 2019