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**DOI**
10.1007/978-3-030-88900-5_15

**Publication date**
2021

**Document Version**
Final published version

**Published in**
Information Systems and Neuroscience - NeuroIS Retreat, 2021

**Citation (APA)**
Kaufmann, F., Rook, L., Lefter, I., & Brazier, F. (2021). Understanding the Potential of Augmented Reality in Manufacturing Environments. In F. D. Davis, R. Riedl, J. vom Brocke, P.-M. Léger, A. B. Randolph, & G. Müller-Putz (Eds.), *Information Systems and Neuroscience - NeuroIS Retreat, 2021* (pp. 128-138). (Lecture Notes in Information Systems and Organisation; Vol. 52 LNISO). Springer. https://doi.org/10.1007/978-3-030-88900-5_15

# Understanding the Potential of Augmented Reality in Manufacturing Environments

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**Abstract.** Manufacturing companies are confronted with challenges due to increasing flexibility requirements and skill gaps. Augmented Reality applications offer an efficient way to overcome these tensions by enhancing the interaction between people and technology. The positive effects of Augmented Reality solutions are often described in individual models in the scientific literature. This research-in-progress aims to aggregate the empirical findings in the usage of Augmented Reality solutions in manufacturing environments. A meta-analysis is conducted to synthesise several small studies into one large study to achieve this. In particular, the meta-analysis will focus on the impact of Augmented Reality applications on cognitive load levels. Furthermore, the effect on processing time and error rates will be evaluated. Initial results of the meta-analysis will be expected and reported at this year's NeuroIS Retreat.

**Keywords:** Augmented reality · Meta-analysis · Manufacturing · Cognitive load

## 1 Introduction

Manufacturing companies are confronted with increasing variants and individualised products, with high-quality requirements and short product life cycles [1]. These companies find themselves in a field of tension between multiple requirements from the buyers' market and the labour market [2].

The heightened product diversity leads to interrupted learning curves, especially in maintenance applications, assembly, and machinery repair as part of manufacturing processes [3, 4]. The management of process complexity is further challenged by an ageing and heterogeneous workforce [5]. Despite these growing challenges, manufacturing systems must be reconfigurable and flexible to react quickly to changes in the buyers' market [6].

Highly experienced operators often meet the demand for flexibility with programming, maintenance, and diagnostic skills [7]. Human beings are still indispensable due to their cognitive abilities and flexibility. In particular, experienced operators can achieve flexible adaptation to changing situations and requirements. This ability to change can hardly be realised economically and technically by automated solutions [8].


F. D. Davis et al. (Eds.): NeuroIS 2021, LNISO 52, pp. 128–138, 2021.
https://doi.org/10.1007/978-3-030-88900-5_15

Simultaneously, operators are exposed to alleviated cognitive and psychological load due to highly flexible employee deployment and continually changing working environments and methods [9]. The underlying information processes must be optimised to reduce both mental and psychological load [10]. However, many manufacturing companies still find themselves confronted with an impractical and inefficient presentation of information on the shop floor [11]. To overcome these challenges, Industry 4.0 solutions that support employees in an agile production environment are promising [12]. In particular, Augmented Reality applications offer a way to support the interaction between people and technology and combine the advantages of manual and automated processes [11].

Cognitive worker assistance systems, including Augmented Reality solutions, offer the potential to increase manufacturing systems' productivity and agility [13]. These devices enable efficient information distribution and support employees in the perception, reception, and processing of information [14]. In this context, the individual roles of employees, their qualifications, and personal characteristics are decisive. Taking them into account enables the provision of specific information adapted to the user and the environment [15]. In this way, an optimal distribution of information on the shop floor can be realised, strengthening manufacturing processes' competitiveness in high-wage geographical locations [16].

## 2 Research Gap

Manufacturing companies are undergoing major changes in today's world of globalization and digitization. Among others, companies – particularly in high-wage countries – are facing growing competition and disruptive market changes. To counter these challenges, Augmented Reality solutions are a promising technology. Among others, Danielsson et al. [17], Terhoeven et al. [18], Egger and Masood [19], Kohn and Harborth [20], and Vanneste et al. [21] illustrate the relevance and potential impact of Augmented Reality in industrial practice. Possible applications of Augmented Reality technologies are very diverse and mainly focus on applications in assembly, maintenance, and logistics processes [18, 19].

A common feature underlying all experiments is that they have not been investigated in practice-relevant, long-term field experiments. Furthermore, individual studies show ambiguous results, and a statistically powerful empirical assessment is still missing. For this reason, a meta-analysis is needed to determine the aggregated empirical influence of Augmented Reality by synthesising several small studies into one large study.

Danielsson et al. [17], Terhoeven et al. [18], Egger and Masood [19], Kohn and Harborth [20], and Vanneste et al. [21] highlight that an efficient implementation of Augmented Reality in manufacturing environments still requires additional research. In particular, a powerful empirical analysis of the effects of such technology is considered a knowledge gap.

## 3 Research Objective and Question

Individual studies in the scientific literature often describe the positive effects of Augmented Reality. Yet, little is known about the actual impact on employees' cognitive load levels or performance in manufacturing environments. Therefore, this research aims to explore the interrelationships in the usage of Augmented Reality solutions in manufacturing environments.

First, characteristics of Augmented Reality solutions in manufacturing environments will be identified to allow a quantification of the impact on variables relevant to manufacturing processes. Following, the target variables can be linked to Augmented Reality solutions' characteristics.

Given the motivation and the research objective of this study, the following central research question for this research-in-progress arises:

> *Can the use of Augmented Reality solutions benefit manufacturing activities and if so, how?*

Based on the central research question, further sub-research questions can be derived to be able to answer the central research question:

1. *Which factors in manufacturing activities can be influenced using Augmented Reality solutions?*

   Initial research shows that the focus of existing literature in manufacturing contexts lies in the influence of Augmented Reality solutions on the variables cognitive load, processing time, and error rate [19, 21]. This research-in-progress focuses on the influence of Augmented Reality solutions on those three variables.

2. *Can those factors be measured and if so, how?*

   Cognitive load in the context of Augmented Reality solutions and manufacturing is mostly measured with the help of the NASA-TLX or NASA-RTLX test [22]. Consequently, this research-in-progress focuses on the assessment of Augmented Reality solutions with these tools. Processing time and error rates are measured during user tests and are comparable for similar test settings.

3. *Can a benefit be achieved and if so, by how much?*

   The researchers expect that this research will provide a more powerful and significant evaluation of Augmented Reality's impact on cognitive load levels in the first place. Furthermore, improved processing times and error rates are expected as a result of reduced cognitive load.

## 4 Methodological Approach

The following section describes the methodological approach to answer and verify the central research question and the corresponding sub-questions. The methodological approach includes four sequential phases as explained in more detail in the following: (1) Meta-analysis, (2) derivation of hypotheses, (3) preparation empirical exploration, (4) execution empirical exploration.

### 4.1 Meta-analysis

First, a meta-analysis is carried out to analyse the state-of-the-art and the influence of Augmented Reality solutions on variables relevant to manufacturing processes. As identified by Egger and Masood [19] and Vanneste et al. [21], relevant variables include cognitive load, processing time, and error rates.

A meta-analysis is used if individual studies available show ambiguous results, and a statistically powerful assessment is still missing. By synthesising several small studies into one large study, a meta-analysis provides higher significance. As a result, a more powerful statistical influence of Augmented Reality on the evaluation criteria processing time, error rate, and cognitive load is expected. The meta-analysis follows six sequential phases: Formulation of the research question, data collection, evaluation of data, analysis and interpretation of data, sensitivity analysis, and presentation of results.

As part of the meta-analysis, a systematic literature search is conducted to collect and evaluate relevant data. The underlying literature search follows the framework by Vom Brocke et al. [22] (as shown in Fig. 1), which builds on five sequential steps: The definition of the review scope, the conceptualization of the topic, the literature search, the literature analysis and synthesis, and the research agenda. Each step includes individual systematic approaches that are in line with collecting and evaluating data as part of the meta-analysis.

The systematic literature review aims to build an extensive literature database covering empirical studies on Augmented Reality technologies in manufacturing environments. Here, the type of technology used to enable Augmented Reality is not specified in advance. Different types of technological enablers and use cases shall be compared, such that the impact and advantages of different technologies on the target variables can be distinguished. The publications contained in the database are evaluated based on an evaluation scheme (see Fig. 5). All identified publications are classified with the help of a homogeneity assessment to avoid the "apples and oranges problem" [24]. The remaining studies are evaluated with regard to minimal statistical requirements to allow extraction and synthesising. Thereupon, the meta-analysis will be carried out with a previously selected software. The software helps to run statistical calculations to allow an evaluation and interpretation of the data. As part of the subsequent sensitivity analysis, the results are verified by checking for statistical heterogeneity, publication bias, and other confounding factors.

### 4.2 Derive Hypotheses

Multiple hypotheses are derived based on the results of the meta-analysis. The hypotheses highlight the influence of Augmented Reality solutions on cognitive load levels. Additionally, the impact of different cognitive load levels on processing time and error rate are assessed. The results of the meta-analysis are expected to show a reduction of cognitive load and a decline of processing time as well as error rates through the usage of Augmented Reality during manufacturing activities.

### 4.3 Preparation and Execution Empirical Exploration

An empirical exploration will be prepared and executed based on the meta-analysis results and the derivation of hypotheses. User tests and surveys help to verify or adjust the formulated hypotheses. The analyses are based on use cases and user tests in the manufacturing department of a chemical and consumer goods company.

For this purpose, research questions are first formulated based on the developed hypotheses and then grouped according to main overarching topics. Based on the research questions, interview questions are formulated. These should encourage the users and experts to provide assessments, descriptions, and narratives on the topic.

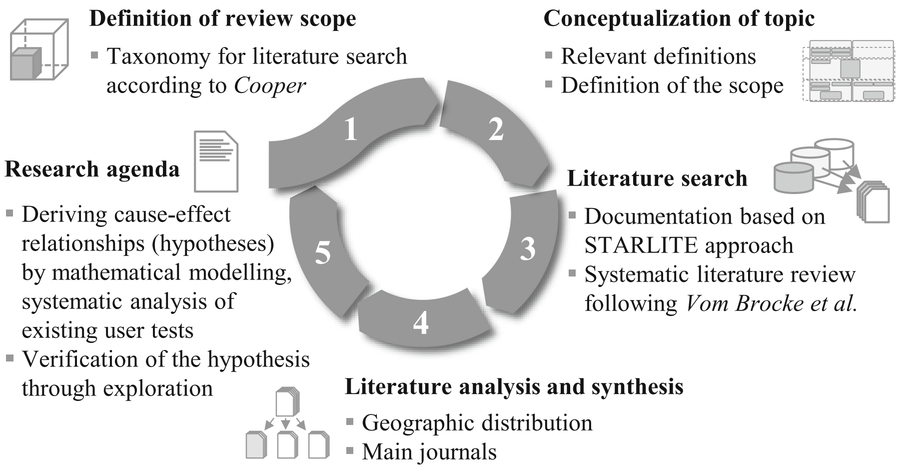


**Fig. 1.** Framework systematic literature review by Vom Brocke et al. [22]

## 5 Initial Results Meta-analysis

This chapter presents the initial results of this research-in-progress. In particular, the first two steps of the meta-analysis, namely the formulation of a research question (Sect. 5.1) and data collection (Sect. 5.2) are described in more detail. Besides, Sect. 5.3 highlights the evaluation scheme that allows identifying primary studies relevant to the given research question. The evaluation of the data, the analysis and the interpretation of the data, the performance of a sensitivity analysis, and a summary of the meta-analysis are part of the research-in-progress.

### 5.1 Formulation of a Research Question

The first step in conducting a meta-analysis is to formulate a research question. As a result, only studies that support the research questions are taken into account in the further course of the meta-analysis. Turabian [25] distinguishes between three types of questions: Conceptual questions, practical questions, and applied questions.

Conceptual questions help readers to understand a certain problem better and to guide the thoughts [25]. Correspondingly, practical questions help develop an approach to change or improve a problematic or improvable situation [25]. Lastly, applied questions help the readers to first better understand a practical problem before solving it. An applied question helps to develop a step towards the solution of a practical problem [25].

This research-in-progress aims to understand the potential of Augmented Reality solutions in manufacturing environments with a meta-analysis. The underlying problem why Augmented Reality solutions are considered to support manufacturing activities is described in Sect. 1. This project thus does not address a conceptual question that helps the reader to understand a problem. In reality, the potential and influence of Augmented Reality solutions must first be researched to develop a concrete procedure to solve the underlying problems. For this reason, the present research question addresses an applied question.

Following Turabian [25], the applied research question of the meta-analysis is as follows:

*What influence do Augmented Reality solutions have on workers' cognitive load, processing times, and error rates during manufacturing activities?*

## 5.2 Collection of Data

As described in Sect. 4, a systematic literature review constitutes the data collection for the meta-analysis. Vom Brocke et al. [23] suggest Cooper's [26] taxonomy for a correct classification of the literature search.

Meta-analysis makes use of empirical studies and aims to achieve statistically more powerful assessments. To allow such assessment, the systematic literature review's focus lies on available research outcomes [26]. This project also aims to "integrate or synthesize past literature that is believed to relate to the same issue" [26]. At the same time, this project aims to identify central issues in Augmented Reality applications that have dominated past endeavors. The literature review attempts to represent the influence of Augmented Reality solutions neutrally. Following Booth [27], the exclusion criteria do not eliminate a particular point of view. Additionally, conclusions will be based on an exhaustive and selective review [26]. The organisation of the systematic literature review follows both a conceptual and methodological approach. Publications that relate to the same abstract ideas and employ similar methods are grouped [26]. Lastly, this review intends to address general scholars and practitioners. As a result, the review tries to pay "greater attention to the implication of the work being covered" [26] than on jargon and details. Figure 2 displays the described taxonomy by Cooper [26].

Next, a search string is created based on the classification of the literature search by Cooper [26]. The search string and different combinations of the keywords help to identify relevant publications in the first place. As shown in Fig. 3, the search string is constructed with three distinct segments: Technology, domain, and the target variable. The corresponding keywords result in 18 individual search strings.

Additionally, the STARLITE methodology is used as a documentation standard (see Fig. 4) [27]. As a result of an exhaustive and selective sampling strategy, this project considers all literature within predefined boundaries. The search for relevant literature

| Characteristic | Categories | | | |
|---|---|---|---|---|
| Focus | **Research outcomes** | Research methods | Theories | Applications |
| Goal | **Integration** | Criticism | **Central Issues** | |
| Perspective | **Neutral Representation** | Espousal of Position | | |
| Coverage | Exhaustive | **Exhaustive and Selective** | Representative | Central |
| Organisation | Historical | **Conceptual** | **Methodological** | |
| Audience | Specialized Scholars | **General Scholars** | **Practitioners** | General Public |

**Fig. 2.** Completed taxonomy following Cooper [25]

| Technology | Domain | Target variable |
|---|---|---|
| • Augmented Reality<br>• Mixed Reality | • Manufacturing<br>• Maintenance<br>• Assembly | • Cognitive load<br>• NASA*<br>• Productivity |

Combination search strings

| # | Technology | Domain | Target variable |
|---|---|---|---|
| 1 | Augmented Reality | Manufacturing | Cognitive load |
| 2 | ⋮ | ⋮ | NASA* |
| 3 | | | Productivity |
| 4 | | Maintenance | Cognitive load |
| 5 | | ⋮ | NASA* |
| 6 | | | Productivity |
| 7 | | Assembly | Cognitive load |
| 8 | | ⋮ | NASA* |
| 9 | | | Productivity |
| 10 | Mixed Reality | Manufacturing | Cognitive load |
| 11 | ⋮ | ⋮ | NASA* |
| 12 | | | Productivity |
| 13 | | Maintenance | Cognitive load |
| 14 | | ⋮ | NASA* |
| 15 | | | Productivity |
| 16 | | Assembly | Cognitive load |
| 17 | | ⋮ | NASA* |
| 18 | | | Productivity |

**Fig. 3.** Keywords and search string combinations

is limited to journal articles and books and is conducted with the help of an evaluation scheme following Vom Brocke et al. [23]. Augmented Reality applications have evolved significantly in recent years, and publications have increased considerably since 2014. Consequently, this thesis includes English and German articles between 2014 and 2021. Augmented Reality solutions are currently implemented in numerous different fields of application. As indicated in Sect. 1, this research project particularly focuses on the manufacturing industry. For this reason, literature without any empirical evaluation of

Augmented Reality solutions in manufacturing environments is excluded. Six different databases are chosen not to miss any relevant research outcomes.

| | | |
|---|---|---|
| S | **S**ampling Strategy | Exhaustive and selective |
| T | **T**ype of Studies | Restriction to journal articles and books |
| A | **A**pproaches | Keyword search in databases, forward search, backward search |
| R | **R**ange of Years | Consideration of all sources published from 2014 to March 2021 |
| L | **L**imits | Limitation to English and German sources |
| I | **I**nclusion & Exclusion | Focus on quantitative evaluation of Augmented Reality solutions in manufacturing environments |
| T | **T**erms used | Augmented Reality/ Mixed Reality, Manufacturing/ Maintenance/ Assembly, Cognitive load/ NASA*/ Productivity |
| E | **E**lectronic Sources | IEEE, ISI Web of Knowledge, JSTOR, Science Direct, Scopus, ABI Informs |

**Fig. 4.** Completed STARLITE approach following Booth [27]

### 5.3 Evaluation of Data

The evaluation of the data follows the described data collection phase and is highly dependent on the latter's results [28]. This phase identifies suitable primary studies to be included in the meta-analysis based on the data collection phase results. The collected primary studies are assessed with the help of a predefined and systematic evaluation scheme. Consequently, individual studies are eliminated, and the relevance and statistical independence of the meta-analysis are strengthened.

As part of the framework for systematic literature reviews (Fig. 1), Vom Brocke et al. [23] suggest a structured literature search process. The STARLITE methodology results form the evaluation scheme's basis and are included in the scheme's first two steps. Figure 5 displays the evaluation scheme used in preparation for the meta-analysis.

The first step of the evaluation scheme is the identification of primary studies. Primary studies are collected based on the STARLITE methodology and the corresponding keywords and search strings. Next, the duplicates are eliminated. Duplicates occur as the keyword search is conducted in multiple databases. Additionally, the results of the keyword search from off-topic journals are eliminated. Following, the eligibility of the remaining articles with regard to the research question is evaluated. Here, the depth of content increases gradually. First, the individual titles are assessed. Second, the abstracts of the remaining primary studies are evaluated. Finally, the full text is assessed. Last, further primary studies are identified through a forward and backward search. The chosen studies from the forward and backward search are evaluated according to the described procedure. As a result of the evaluation scheme, a relevant and predefined literature database is created.

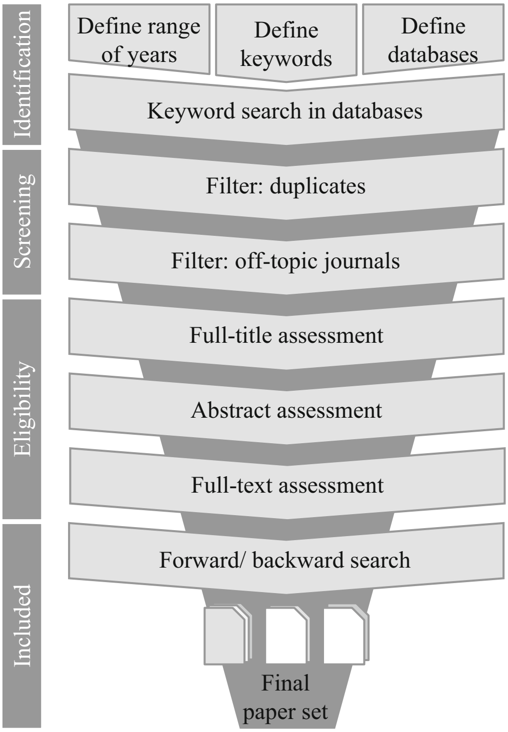


**Fig. 5.** Evaluation of data following Vom Brocke et al. [23]

## 6 Discussion and Conclusion

The present research-in-progress aims to understand the influence of Augmented Reality applications on manufacturing environments. A meta-analysis will be conducted to aggregate empirical user studies. The focus of this research-in-progress lies on the variables cognitive load, processing time, and error rates and its interrelationships.

This research-in-progress could in future work be used to explore the technostress produced by employees forced to work with Augmented Reality technologies. It would make perfect sense to assess the impact of technostress on cognitive load levels and productivity variables. In a next step, traditional electroencephalography (EEG) procedures for testing cortisol-inhibition linkages [29] could be adapted to empirical analysis.

## References

1. Lušić, M., Fischer, C., Bönig, J., Hornfeck, R., Franke, J.: Worker information systems: state of the art and guideline for selection under consideration of company specific boundary conditions. Proc. CIRP **41**, 1113–1118 (2016). https://doi.org/10.1016/j.procir.2015.12.003
2. Teubner, S., Vernim, S., Dollinger, C., Reinhart, G.: Worker-centred production management – approaches to flexibility-and productivityen-hancing integration of production workers into an increasingly digitized and connected production system. ZWF Zeitschrift fuer Wirtschaftlichen Fabrikbetr. **113**(10), 647–651 (2018). https://doi.org/10.3139/104.111983

3. Gaimon, C., Singhal, V.: Flexibility and the choice of manufacturing facilities under short product life cycles. Eur. J. Oper. Res. **60**(2), 211–223 (1992). https://doi.org/10.1016/0377-2217(92)90094-P
4. Masoni, R., et al.: Supporting remote maintenance in industry 4.0 through augmented reality. Proc. Manuf. **11**, 1296–1302 (2017). https://doi.org/10.1016/j.promfg.2017.07.257
5. Hold, P., Erol, S., Reisinger, G., Sihn, W.: Planning and evaluation of digital assistance systems. Proc. Manuf. **9**, 143–150 (2017). https://doi.org/10.1016/j.promfg.2017.04.024
6. ElMaraghy, H., et al.: Product variety management. CIRP Ann. - Manuf. Technol. **62**(2), 629–652 (2013). https://doi.org/10.1016/j.cirp.2013.05.007
7. Sethi, A.K., Sethi, S.P.: Flexibility in manufacturing: a survey. Int. J. Flex. Manuf. Syst. **2**(4), 289–328 (1990). https://doi.org/10.1007/BF00186471
8. Stoessel, C., Wiesbeck, M., Stork, S., Zaeh, M.F., Schuboe, A.: Towards optimal worker assistance: investigating cognitive processes in manual assembly. In: Mitsuishi, M., Ueda, K., Kimura, F. (eds.) Manufacturing Systems and Technologies for the New Frontier, pp. 245–250. Springer, London (2008). https://doi.org/10.1007/978-1-84800-267-8_50
9. Vernim, S., Reinhart, G.: Usage frequency and user-friendliness of mobile devices in assembly. Procedia CIRP **57**, 510–515 (2016). https://doi.org/10.1016/j.procir.2016.11.088
10. Chen, B., Wan, J., Shu, L., Li, P., Mukherjee, M., Yin, B.: Smart factory of industry 4.0: key technologies, application case, and challenges. IEEE Access **6**, 6505–6519 (2017). https://doi.org/10.1109/ACCESS.2017.2783682
11. Burggräf, P., Dannapfel, M., Adlon, T., Riegauf, A., Schmied, J.: Automation configuration evaluation in adaptive assembly systems based on worker satisfaction and costs. In: Nunes, I.L. (ed.) AHFE 2019. AISC, vol. 959, pp. 12–23. Springer, Cham (2020). https://doi.org/10.1007/978-3-030-20040-4_2
12. Johansson, P.E.C., Malmsköld, L., Fast-Berglund, Å., Moestam, L.: Enhancing future assembly information systems - putting theory into practice. Proc. Manuf. **17**, 491–498 (2018). https://doi.org/10.1016/j.promfg.2018.10.088
13. Keller, T., Bayer, C., Bausch, P., Metternich, J.: Benefit evaluation of digital assistance systems for assembly workstations. Proc. CIRP **81**, 441–446 (2019). https://doi.org/10.1016/j.procir.2019.03.076
14. Syberfeldt, A., Danielsson, O., Gustavsson, P.: Augmented reality smart glasses in the smart factory: product evaluation guidelines and review of available products. IEEE Access **5**, 9118–9130 (2017). https://doi.org/10.1109/ACCESS.2017.2703952
15. Galaske, N., Anderl, R.: Approach for the development of an adaptive worker assistance system based on an individualized profile data model. In: Advances in Intelligent Systems and Computing, vol. 490, pp. 543–556 (2016). https://doi.org/10.1007/978-3-319-41697-7_47
16. Dachs, B., Kinkel, S., Jäger, A.: Bringing it all back home? Backshoring of manufacturing activities and the adoption of Industry 4.0 technologies. J. World Bus. **54**(6) (2019). https://doi.org/10.1016/j.jwb.2019.101017
17. Danielsson, O., Holm, M., Syberfeldt, A.: Augmented reality smart glasses for operators in production: survey of relevant categories for supporting operators. Proc. CIRP **93**, 1298–1303 (2020). https://doi.org/10.1016/j.procir.2020.04.099
18. Terhoeven, J., Schiefelbein, F.P., Wischniewski, S.: User expectations on smart glasses as work assistance in electronics manufacturing. Proc. CIRP **72**, 1028–1032 (2018). https://doi.org/10.1016/j.procir.2018.03.060
19. Egger, J., Masood, T.: Augmented reality in support of intelligent manufacturing – a systematic literature review. Comput. Ind. Eng. **140**, 106195 (2020). https://doi.org/10.1016/j.cie.2019.106195
20. Kohn, V., Harborth, D.: Augmented reality - a game changing technology for manufacturing processes? (2018). https://aisel.aisnet.org/ecis2018_rp/111/. Accessed 23 Feb 2021

21. Vanneste, P., Huang, Y., Park, J.Y., Cornillie, F., Decloedt, B., Van den Noortgate, W.: Cognitive support for assembly operations by means of augmented reality: an exploratory study. Int. J. Hum. Comput. Stud. **143** (2020). https://doi.org/10.1016/j.ijhcs.2020.102480
22. Jeffri, N.F.S., Awang Rambli, D.R.: A review of augmented reality systems and their effects on mental workload and task performance. Heliyon **7**(3) (2021). https://doi.org/10.1016/j.heliyon.2021.e06277
23. Vom Brocke, J., Simons, A., Niehaves, B., Riemer, K., Plattfaut, R., Cleven, A.: Reconstructing the giant: on the importance of rigour in documenting the literature search process (2009). www.uni.lihttp://aisel.aisnet.org/ecis2009/161/. Accessed 22 Feb 2021
24. Lipsey, M.W., Wilson, D.B.: Practical Meta-analysis. SAGE Publication, Inc. (2001). https://psycnet.apa.org/record/2000-16602-000. Accessed 23 Feb 2021
25. Turabian, K.L.: A Manual for Writers of Research Papers, Theses, and Dissertations: Chicago Style for Students and Researchers. University of Chicago Press (2013)
26. Cooper, H.M.: Organizing knowledge syntheses: a taxonomy of literature reviews. Knowl. Soc. **1**(1), 104–126 (1988). https://doi.org/10.1007/BF03177550
27. Booth, A.: "Brimful of STARLITE": toward standards for reporting literature searches. J. Med. Libr. Assoc. **94**, 421 (2006)
28. Forza, C., Di Nuzzo, F.: Meta-analysis applied to operations management: summarizing the results of empirical research. Int. J. Prod. Res. **36**(3), 837–861 (1998). https://doi.org/10.1080/002075498193714
29. Tops, M., Boksem, M.A.S.: Cortisol involvement in mechanisms of behavioral inhibition. Psychophysiology **48**(5), 723–732 (2011). https://doi.org/10.1111/j.1469-8986.2010.01131.x