Business Process Reengineering in Agile Manufacturing – A Mixed Method Research

Khadija Lahlou, Khaled Medini, Thorsten Wuest, Qussay Jarrar

Business Process Reengineering in Agile Manufacturing – A Mixed Method Research

Khadija Lahlou[1], Khaled Medini[2](✉), Thorsten Wuest[3], and Qussay Jarrar[2]

[1] Mines Saint-Etienne, Saint-Etienne, France
[2] Mines Saint-Etienne, Univ Clermont, INOP Clermont Auvergne, CNRS, UMR 6158 LIMOS, 42023 Saint-Etienne, France
khaled.medini@emse.fr
[3] Industrial and Management Systems Engineering, West Virginia University, Morgantown, WV 26505, USA

Abstract. Business process reengineering has been successfully deployed to improve efficiency, reduce cost, and improve customer satisfaction and organizational agility. The aim of this paper is to provide an overview of the applications of BPR in the context of agile manufacturing and to identify the barriers and drivers of BPR adoption in practice. To this end, a mixed method is used combining literature review and interviews. Drivers, and technical and human barriers identified from the literature are assessed and extended with insights from practitioners. The results indicate also a general agreement on the relevance of BPR to agile manufacturing. The findings contribute to a better understanding of the opportunities and challenges associated with the implementation of BPR in agile manufacturing, and inform practitioners and decision-makers in their efforts to improve organizational agility and performance.

Keywords: Business process reengineering · agile manufacturing · industry 4.0 · smart manufacturing · lean manufacturing

1 Introduction

Business Process Reengineering (BPR) has been widely recognized as a process management approach for improving organizational performance by redesigning business processes [1–3]. With an increasing emphasis on agility across businesses [4], interest grows to integrate BPR with agile manufacturing. BPR has shown success in improving efficiency, reducing cost, improving customer satisfaction and organizational agility. However, the implementation of BPR initiatives is heavily influenced by a variety of organizational factors, such as culture [1], flexibility, and agility [5].

The aim of this paper is to provide an overview of the applications of BPR in the context of agile manufacturing as well as to identify the barriers and drivers of BPR adoption in practice. The results of this study will contribute to a better understanding of the potential benefits and limitations of BPR in the context of agile manufacturing and

Published by Springer Nature Switzerland AG 2023
E. Alfnes et al. (Eds.): APMS 2023, IFIP AICT 689, pp. 326–338, 2023.
https://doi.org/10.1007/978-3-031-43662-8_24

will inform practitioners and decision-makers in their efforts to improve organizational performance.

The remainder of the paper is organized as follows: Sect. 2 provides an overview of background literature. Section 3 presents the research methodology and material. Sections 4 and 5 report respectively on literature and practitioners' insights into drivers and barriers. Results are discussed in Sect. 6. The paper ends with concluding remarks in Sect. 7.

2 Background Literature

2.1 Concepts Overview

BPR is defined as "*the fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical, contemporary measures of performance, such as cost, quality, service and speed*" [6]. BPR as a discipline has been around since the early 90s, promoted notably by Hammer (1990) and reinforced by the book by Hammer and Champy [7]. From a practical point of view, BPR is a structured approach to examine current processes, identify areas for improvement, and implement changes to create a more efficient and effective business operation [8]. This approach enables analyzing and redesigning business processes to improve organizational performance [2]. The ultimate goal of BPR is to enhance organizational agility by creating a flexible and adaptable business process architecture [5, 9].

Agility is defined as the ability of an organization to respond quickly and effectively to changing circumstances [5]. Agility as a production philosophy emphasizes flexibility, responsiveness, and adaptability to change [10]. This is in line with ***agile manufacturing***'s early definition by Yusuf et al. [4], as a concept that involves quickly adapting to changing market demands and customer needs by improving the flexibility and responsiveness of manufacturing processes. Agile manufacturing promotes a focus on customer needs and a willingness to change business processes and organizational structures [5]. It involves the use of advanced technologies, such as real-time monitoring and control systems, to enable rapid and efficient production of customized products, with a focus on reducing lead times and improving customer satisfaction [10].

2.2 Applications of BPR in Agile Manufacturing

BPR has been used in agile manufacturing context with a focus on improving efficiency, reducing wastes, as well as enhancing customer satisfaction through improved product quality and faster delivery times. Some of the specific applications of BPR in agile manufacturing include enterprise information systems improvement, operations management, and smart manufacturing [2, 11, 12].

BPR has been widely applied in the enterprise information systems field [8]. Enterprise information systems are an essential component in the implementation of advanced manufacturing systems, however, they have some limitations such as lack of continuous integration, business intelligence, value based processes, and dynamic optimization. Qu et al. [8] promote the use of BPR to ensure the alignment of enterprise information systems with the requirements of intelligent manufacturing systems, such as autonomous operations, and sustainable values.

BPR has several other application areas in operations management. In fact, it supports streamlining procurement and logistics processes, resulting in faster delivery times and reduced inventory costs within supply chains. BPR also improves scheduling and reduces lead times, resulting in faster product delivery to customers, as well as quality management (QM). Within QM, it supports the reduction of defects and improves product quality through the reengineering of quality control processes. In the area of lean-agile manufacturing, BPR helps identify and eliminate unnecessary activities, reduce cycle time, improve flexibility, and increase efficiency in manufacturing processes [2].

In the context of smart manufacturing, BPR was used to integrate RFID technology for warehouse management [12]. The authors put forth the benefits of BPR in terms of efficiency improvement, cost reduction, information system integration, communication and collaboration enhancement, automation of tasks and processes to increase productivity and reduce errors. Additionally, the authors note that BPR can be used to redesign organizational structures and workflows, which can help to optimize resource allocation and improve overall business performance. In a recent study, Al-Anqoudi et al. [11] underlined the role of machine learning as a novel solution approach to automate BPR.

3 Research Methodology and Materials

The paper's research methodology relies on a combined approach of literature review providing theoretical insights and interviews to confirm and expand on theoretical results and collect practitioners' feedback.

The review of the current literature aims to explore published BPR applications, drivers and barriers in agile manufacturing. To ensure rigor and transparency, this work is following Systematic Literature Review (SLR) methodology and utilizes PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines [13].

SLR method was chosen due to its ability to provide a systematic and unbiased overview of the available evidence on a given topic. According to Kitchenham and Charters [14], SLR is a research method that seeks to systematically identify, evaluate, and synthesize all available evidence on a specific research question or topic of interest. SLR involves a comprehensive search of relevant literature, critical appraisal of the quality of the studies, and a synthesis of the findings to answer the research question. The application of SLR involved several steps, including defining the research question, developing search queries, selecting studies based on inclusion and exclusion criteria, and critically assessing the quality of the selected studies [15].

This work aims to address the following question: "*What are the barriers and drivers of BPR adoption in agile manufacturing?*".

Search queries were build based on a combination from each of the following groups of keywords {"business process reengineering", "BPR", "agile manufacturing"} and {"implementation", "barriers", "success factors"}. The papers were retrieved from Scopus. Additionally, a search technique was employed that combines closely related terms such as "business process management" or "business process modeling" and "agility" or "flexibility".

The resulting articles were screened and selected based on the defined inclusion criteria, i.e., published studies between 2011 and February 2023, studies focusing on BPR applications, barriers or drivers in agile manufacturing, studies using primary data collection methods such as surveys, case studies, experiments or interviews, and exclusion criteria, i.e., non-English articles, studies with no empirical investigation, studies not available in full-text format, duplicates or articles with significant overlap with other included studies.

The initial search resulted in 36 articles. However, when considering the inclusion criterion of agile manufacturing context, the results yielded eight relevant articles, which is a relatively low number of relevant studies. In fact, the initial search returned studies that focused on agile BPR or how to use BPR with an agile method, rather than the application of BPR in agile manufacturing. To address this issue, we decided to use snowballing technique to expand our search beyond the initial set of studies. This technique involves examining the reference lists of relevant studies and using them to identify additional studies that meet our inclusion criteria [16]. This ultimately resulted in a total of 14 relevant articles.

Figure 1 shows the location distribution of the identified papers. More than half (54%) of the identified relevant papers report on research conducted in Europe (e.g., France, UK). Asia represents around one third (31%) of the identified papers. The search resulted only in few papers stemming from the Americas and Africa, which each represent less than 10%.

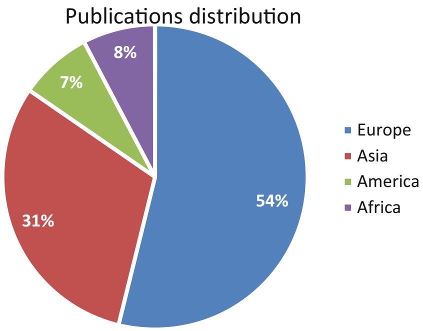

Fig. 1. Publications distribution among continents

Complementarily, semi-structured interviews were used to confront the results of the literature review and to obtain additional information about the barriers and drivers of BPR adoption from practitioners and other experts. To this end, a questionnaire was built and used during the interviews. It is structured in three main sections, i) respondent profile (i.e., job category, activity sector), ii) drivers' assessment, and iii) barriers' assessment. The questionnaire was spread using social media networks (*LinkedIn*) as well as using emails among practitioners in manufacturing (e.g., production, design, supply chain, information system, quality). Respondents were asked to select the drivers and barriers they believe to have a significant impact on BPR adoption in agile manufacturing. In order to gain further insights into BPR relevance to agile manufacturing from a practitioners' points of view, a general question was added about the role of a process approach in improving agility within manufacturing organizations. To address this question, the respondents rate their level of agreement on a Likert scale ranging from 1 ("strongly disagree") to 5 ("strongly agree").

The questionnaire results were analyzed using descriptive statistics, while the interview results were analyzed using content analysis. By triangulating the results from the literature review and interviews, the resulting understanding of the drivers and barriers to BPR adoption can be considered more complete.

In total 14 responses were collected with respondents' job titles include the following: consultant, project manager, functional team manager, and equivalent jobs. All respondents are involved directly or indirectly in the manufacturing sector. This sample size is assumed to be sufficient for the current study providing preliminary insights into the topic.

4 Literature Insights into Drivers and Barriers

4.1 Drivers to BPR Adoption

Incorporating BPR into smart manufacturing shows promising results with regard to cost savings, increased efficiency, and reduced cycle time [6, 8, 9, 11, 12, 17]. BPR provides managers with an easy way to manage, implement, and accommodate internal and external changes, financial environment, requirements, and technological changes. BPR addresses changes in systems and workflows, with ontologies representing organizational knowledge. It develops a process-based cost/value and proposes strategic information in order to plan the strategic goals for the long term setting [3, 5, 8, 11, 12].

The application of BPR could eliminate wastes, unwanted activities, unwanted transportation, according to Six Sigma approach it reduces variance. BPR supports also *Kaizen* methodology in particular small and incremental changes continuously [11].

Among the drivers identified by Hussein et al. [3] is also increased competition within the marketplace To remain competitive, organizations must continuously improve their operations and processes. This, in turn, leads to pressure to improve efficiency and reduce costs. The desire to improve customer satisfaction is another significant driver for BPR. Organizations recognize that meeting and exceeding customer expectations is critical to their success. Furthermore, the need to comply with regulations and standards is driving factor for organizations to reengineer their processes. Additionally, the recognition of the potential benefits of technology and process improvements can be considered a driver for BPR. By leveraging technology and process improvements, organizations can enhance their operations, reduce costs, and improve customer satisfaction [3].

The drivers of BPR in the food and beverage industry (from a case study in Nigeria) include the need to improve organizational performance, enhance customer satisfaction, increase profitability, improve quality, and increase efficiency. Other drivers of BPR identified in the study include the need to respond to changing market demands, increase competitiveness, and address organizational problems such as duplication of efforts, poor communication, and lack of coordination among departments [18] (Table 1).

Table 1. Drivers of BPR adoption

Drivers	References (examples)
Cost reduction	[2, 6, 8, 9, 11, 12]
Efficiency	[2, 6, 8, 9, 11, 12]
Time saving	[2, 6, 8, 9, 11, 12]
Change and adaptation support	[3, 5, 8, 11, 12]
Systems and workflow change support	[3, 5, 8, 11, 12]
Strategic planning support	[3, 5, 8, 11, 12]
Eliminate non-added value activities	[11]
Variance reduction	[11]
Support small and incremental changes	[11]
Organizational performance improvement	[3, 18]
Customer satisfaction improvement	[3, 18]
Profitability	[3, 18]
Quality	[3, 18]
Responsiveness to market evolution	[3, 18]
Competitiveness	[3, 18]
Problem solving at organizational level	[3, 18]

4.2 Barriers to BPR Adoption

BPR is a complex and challenging endeavor that can be hindered by a variety of barriers. These barriers can be classified into two main categories based on results identified in the literature: i) technical barriers and ii) human barriers [1].

BPR initiatives face several ***technical barriers*** including lack of reliable advanced information technology (IT), unclear strategy and inadequate business case, unrealistic/unreasonable/unjustifiable expectations from the BPR project, incomplete BPR implementation, and insufficient authority given to the BPR team [17]. Furthermore, measuring the results of BPR initiatives can be challenging. The lack of appropriate tools and technologies can hinder the effectiveness of BPR initiatives [1]. Process complexity and regulations may also hinder BPR adoption [5, 11]. Other technical barriers identified by Qu et al. [8], include issues related to information systems and technology infrastructure, such as incompatible systems, lack of integration, and data quality problems (Table 2).

Human barriers may include a lack of readiness, ineffective communication, poor leadership style, lack of top management commitment, poor collaboration in work, and resistance to change [2, 3]. Employee resistance to change, lack of understanding of BPR concepts and methodology, lack of employee involvement, and inadequate communication and training impede the success of BPR initiatives. In addition, there may be opposition from internal staff and union members, as well as a lack of interest from

Table 2. Technical barriers to BPR adoption

Technical barriers	References (examples)
Lack of advanced IT	[1, 3]
Unclear strategy and inadequate business case	[1, 3]
Unrealistic/unreasonable expectations	[1, 3]
Incomplete BPR implementation	[1, 3]
Insufficient authority	[1, 3]
Difficult to measure results	[1, 3]
Complexity	[5, 11]
Regulations	[5, 11]
Lack of integration and data quality	[8]

many users, which can make it difficult to achieve buy-in and engagement with the initiative [1, 3]. Internal resistance hinders the work making it difficult to analyze and model several processes, which adds uncertainty to subsequent redesign proposals and related structural changes. CEOs may also level political interests with objective goals, leading to a misalignment of priorities. Moreover, the gradual shift of operational teams focus from core business process redesign to problem-solving and automation of existing processes may obstruct the implementation of BPR. Finally, there may be a tendency to hide failure signs, consciously or unconsciously, which can undermine the effectiveness of BPR initiatives [19] (Table 3).

Table 3. Human barriers to BPR adoption

Human barriers	References (examples)
Lack of preparation	[2, 3]
Ineffective communication	[2, 3]
Lack of management commitment	[2, 3]
Poor collaboration	[2, 3]
Resistance to change	[2, 3]
Lack of understanding	[1, 3]
Insufficient training	[1, 3]
Internal opposition	[1, 3]
Lack of users interests	[1, 3]
Change of priorities	[1, 3]

5 Practitioners Feedback on Drivers and Barriers

5.1 Practitioners' Feedback on the Drivers to BPR Adoption

Practitioners' feedback on the drivers is summarized in Fig. 2. There is an agreement on quality improvement and time savings as driving factors of BPR implementation in agile manufacturing (86%). Efficiency (79%) and cost reduction (71%) are also seen as important drivers of BPR adoption. This is consistent with the literature indicating the relevance of BPR to process improvement [3]. The practitioners however less emphasize customer satisfaction than the literature suggests (64%). Similarly, only 57% of the respondents believe that change and adaptation are among BPR adoption drivers, while only 36% assume systems and workflow change support is among the drivers. Unexpectedly, only 21% see BPR as means for improving responsiveness to market evolution. These insights and discrepancies might be rooted in contextual information with the companies which may limit the use of BPR.

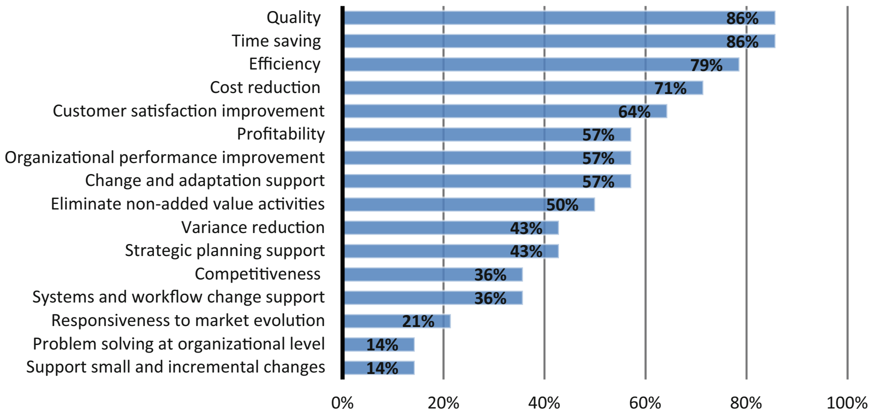

Fig. 2. Perceived drivers to the Adoption of BPR in agile manufacturing

Overall, a majority of 84% of the respondents agree on the relevance of BPR in agile manufacturing which can be seen in Fig. 3. This validates the initial assumption of the author team.

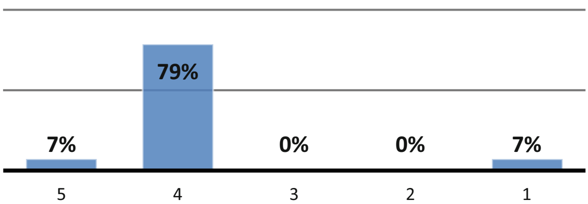

Fig. 3. Perceived impact of process approach on organizational Agility

5.2 Practitioners Feedback on the Barriers of BPR Adoption

Practitioners' feedback on technical barriers is summarized in Fig. 4. The results highlight some of the key challenges that organizations face when implementing BPR initiatives in agile manufacturing. The extreme complexity of processes (36%), with unnecessary activities, underscores the need for a streamlined and efficient approach to process design and execution. The lack of a clear strategy (36%) and incomplete implementation (29%) indicate a lack of planning and preparation before engaging BPR projects. The lack of suitable advanced IT was cited as one important barrier which suggests that many companies are struggling to keep up with the rapid pace of technological advances and may be falling behind their competitors. Other barriers include not suited authority to conduct BPR projects and unrealistic expectations (14%) which is in line with the inadequate business case (36%) as barrier for BPR.

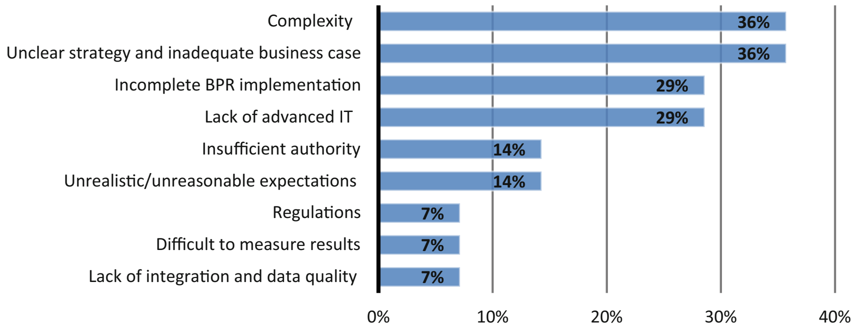

Fig. 4. Perceived technical barriers to the adoption of BPR in agile manufacturing

Practitioners' feedback on human barriers is summarized in Fig. 5. The survey results highlighted the significant human barriers that organizations face when implementing process redesign initiatives in agile production. The lack of user understanding and interest (57%) underscores the need to better communicate the benefits of process redesign and how it can improve processes and drive business success. It is essential to involve employees affected by the project in the majority of the stages, including the design of the solution, in order to take their views into account and integrate them into the project, rather than limiting their involvement to the implementation phase. This would help tackle the problems of low users' interest and poor collaboration highlighted respectively by 50% and 36% of the respondents. Unsurprisingly, ineffective communication (50%) and insufficient management involvement (50%) are among the drivers in this category. This underlines the importance of strong leadership and effective communication strategies to ensure that all stakeholders are on board with BPR initiatives and working toward common goals. Lack of training (21%) and therefore not prepared staff (36%) barriers should be also addressed in order to overcome the problems of resistance to change (36%) and internal opposition (14%) and ensure successful BPR implementation projects.

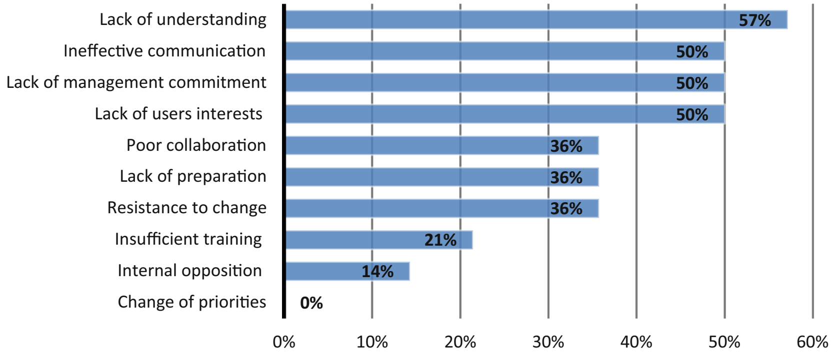

Fig. 5. Perceived human barriers to the adoption of BPR in agile manufacturing

During the interviews, experts and consultants highlighted the presence of internal and external environment barriers as well as economic factors in addition to the barriers identified in the literature.

Internal environment barriers relate to ergonomic issues in the workplace, such as poorly designed workspaces and inadequate equipment. External environment barriers include regulatory restrictions, such as the General Data Protection Regulation (GDPR), environmental regulations, and laws that restrict business practices. Addressing these environmental barriers during the planning phase of BPR initiatives is critical to ensure that the implementation process is not hindered by unexpected barriers.

The cost associated with implementing BPR initiatives can be a major barrier for many organizations, particularly in small and medium-sized enterprises (SMEs). In some cases, the cost of implementing BPR can outweigh the benefits, which can make it difficult to convince decision makers to support the initiative. BPR requires a significant investment of resources, including time, money, and personnel, which can be difficult for companies with limited resources. In addition, the benefits of BPR may not be immediately apparent, which can make it difficult to justify the cost of the initiative to stakeholders.

All these factors are critical and interrelated. Addressing them requires a multifaceted approach that involves the participation and engagement of various stakeholders. By understanding these barriers and their underlying causes, organizations can develop effective strategies to overcome them and ensure the successful implementation of BPR initiatives. Organizations need to focus on careful planning, strategic decision-making, and the adoption of the appropriate technologies to overcome these barriers and successfully implement BPR initiatives.

6 Discussion

This paper contributes towards the capitalization on the drivers and barriers of BPR implementation in agile manufacturing. This theoretical contribution is complementary with the literature, generally focusing on service industry, by specifically examining the context of agile manufacturing. Understanding the drivers and barriers will pave the ground for developing well-suited approaches, methods and tools in order to aid BPR implementation towards agility and performance improvement in manufacturing. Example of relevant works in this area are the process model fragments used by Erasmus et al. [20] to model manufacturing processes. Although research involving business process management in manufacturing is relatively scare, an emerging research stream can be identified in the literature [20, 21]. Industry 4.0 technologies and the growing body of literature addressing smart manufacturing are among the drivers of this orientation.

Given the alignment of objectives of BPR and Smart Manufacturing, there are varieties of avenues for future research that are possible. To-date, there is a lack of tangible data-backed metrics that allow for a quantification of BPR drivers and barriers. Given the data-driven nature of smart manufacturing technologies and processes, this presents an opportunity to align the ability for data collection, data availability, and process execution with the existing results presented here to develop such metrics. Providing quantifiable and measurable metrics are expected to support the adoption as companies prefer data-backed insights when making decisions.

Complementarily, another perspective involves the exploration of the synergies between knowledge management and BPR. For instance knowledge based systems could be used to improve efficiency of BPR projects. These later could lead in turn to enrich the knowledge base with insights regarding business processes, best practices and know-how.

From a practical point of view, the results provide insights to decision makers in manufacturing organizations to better prepare for and execute BPR projects. For instance, BPR requires a comprehensive approach and collaboration between different departments and stakeholders as well as integration and orchestration efforts [21]. Understanding and prioritizing the drivers and barriers is expected to help optimize material and human resources use by targeting most critical improvement areas allowing for significant savings for manufacturing companies. The results provide also valuable input to risk identification during BPR projects planning by underlying pain points related to technical and human aspects.

Looking at the results of the interviews of practitioners, some observations are worthy of discussion. Overall, it is interesting to note that the overall agreement of practitioners with the literature identified human barriers seems to be higher than it was for technical barriers. At the same time, the agreement with the identified drivers exceeds both. There are several possible reasons for these results. One possible explanation might be rooted in the implementation stage of the practitioners BPR journey. Assuming several are in the early planning stages, they will be more familiar with the drivers as they are relevant for decision making whether or not to engage in BPR in the first place. The barriers emerge during the later stage of the implementation and also depend on the context and role of the interviewee. We are not able to conclusively answer the question of why these discrepancies exist at this point and suggest further research is needed to better understand these discrepancies and the root causes. This is relevant also for developing adequate support mechanisms moving forward and establish a solid foundation for future research in the field.

Future research could help address the research perspectives identified in this study as well as overcome its limitations. For instance, the sample size of the survey respondents does currently not provide statistical validity of the derived insights.

7 Conclusion

The paper combines a literature review and interviews with practitioners to derive insights into drivers and barriers for BPR adoption in agile manufacturing. Generally, the results highlight the importance of BPR in achieving agility in manufacturing. Implementing BPR is however hindered by several barriers which need to be addressed. The interviews revealed additional barriers which may indicate that further research is still needed to provide a more comprehensive overview of challenges, drivers and barriers ahead of BPR adoption towards more agile manufacturing.

Acknowledgments. The authors would like to thank the interviewees for their time and valuable input. This work is partly supported by the German-French Academy for the Industry of the Future through RAMP-UP II project.

References

1. Omidi, A., Khoshtinat, B.: Factors affecting the implementation of business process reengineering: taking into account the moderating role of organizational culture (Case Study: Iran Air). Procedia Econ. Finance **36**, 425–432 (2016)
2. Bhaskar, H.L.: A study of business process reengineering (BPR) in manufacturing industry perspective. Int. J. Manage. Behav. Sci. **1**, 239–247 (2012)
3. Hussein, B., Bazzi, H., Dayekh, A., Hassan, W.: Critical analysis of existing business process reengineering models: towards the development of a comprehensive integrated model. J. Project Program Portfolio Manage. **4**(1), 30 (2013)
4. Yusuf, Y.Y., Sarhadi, M., Gunasekaran, A.: Agile manufacturing: the drivers, concepts and attributes. Int. J. Prod. Econ. **62**(1–2), 33–43 (2000)
5. Gong, Y., Janssen, M.: From policy implementation to business process management: principles for creating flexibility and agility. Govern. Inf. Q. **29**(1), 561–571 (2012)
6. Siregar, I.W.: A literature review on business process reengineering. Am. Int. J. Bus. Manage. **7**(9), 1–11 (2021)
7. Hammer, M., Champy, J.: Reengineering the Corporation: A Manifesto for Business Revolution. Harper Collins, New York (1993)
8. Qu, Y., et al.: An integrated framework of enterprise information systems in smart manufacturing system via business process reengineering. Proc. Inst. Mech. Eng. Part B: J. Eng. Manuf. **233**(11), 095440541881684 (2018)
9. Meymand, M., Mollaei, E.: The effect of business process re-engineering factors on organizational agility using path analysis: case study of ports & maritime organization in Iran. Asian Econ. Fin. Rev. **4**, 1849–1864 (2014)
10. Llamas, V., Coudert, T., Geneste, L., Romero-Bejarano, J.C., de Valroger, A.: Proposition of an agile knowledge-based process model. IFAC-PapersOnLine **49**(12), 1092–1097 (2016)
11. Al-Anqoudi, A., Al-Hamdani, A., Al-Badawi, M., Hedjam, R.: Using machine learning in business process reengineering. Big Data Cogn. Comput. **5**, 61 (2021)

12. Bevilacqua, M., Ciarapica, F.E., Marchetti, B.: Integration of BPR and RFID technology in a process industry: spare parts warehouse management analysis. Int. J. RF Technol. **2**, 205–223 (2011)
13. Wilson, P., et al.: How evidence-based is an 'evidence-based parenting program'? A PRISMA systematic review and meta-analysis of Triple P. BMC Med. **10**, 130 (2012)
14. Kitchenham, B., Charters, S.: Guidelines for performing systematic literature reviews in software engineering, Technical report EBSE 2007-001, Keele University and Durham University Joint Report (2007)
15. Fernández-Sáez, A.M., Genero Bocco, M., Romero, F.P.: SLR-Tool - a tool for performing systematic literature reviews. In: Proceedings of the 5th International Conference on Software and Data Technologies, vol. 2 (2010)
16. Wohlin, C.: Guidelines for snowballing in systematic literature studies and a replication in software engineering. In: Proceedings of the 18th International Conference on Evaluation and Assessment in Software Engineering, pp. 1–10 (2014)
17. Bhaskar, H.L.: Business process reengineering framework and methodology: a critical study. Int. J. Serv. Oper. Manage. **29**(4), 527–556 (2018)
18. Olajide, O.A., Idowu, O.O.: Effects of business process reengineering on organizational performance in the food and beverage industry in Nigeria. J. Bus. Manage. Res. **3**(1), 57–74 (2020)
19. Kock, N.F., McQueen, R.J., Baker, M.: BPR in the public sector: a case of successful failure. In: Gray, V., Llanes, V. (eds.) Proceedings of AIBSEAR Conference, pp. 485–490 (1996)
20. Erasmus, J., Vanderfeesten, I., Traganos, K., Grefen, P.: Using business process models for the specification of manufacturing operations. Comput. Ind. **123**, 103297 (2020)
21. Reijers, H.A.: Business process management: the evolution of a discipline. Comput. Ind. **126**, 103404 (2021)