

Class Notes Jan vom Brocke & Elena Gorbacheva

The BPM Competence Gap – An Empirical Investigation of the Demand and Supply Side

Abstract

In this note, we discuss the findings of two studies on the demanded and supplied competencies in the Business Process Management (BPM) field that analyzed 1,507 BPM-related job advertisements and 10,405 profiles of BPM professionals, respectively. The studies show that, while organizations require a diverse set of BPM-related competencies, employees report far fewer competencies in their public profiles. In particular, social and problem-solving competencies are underrepresented on the supply side. Perhaps the BPM workforce as a whole lacks such competencies, or employees consider them not worth declaring. Understanding of the demanded competencies and the gaps between them and the supplied competencies is of value for BPM educators who wish to help improve BPM curricula and for future BPM professionals who seek to enter and eventually advance in the BPM field.

Introduction

BPM professionals are an integral part of all BPM initiatives' success (vom Brocke & Rosemann, 2015), as these professionals' expertise and commitment is central to the efficient management of business processes. According to Kokkonen (2014), "[i]mproved BPM technology without effective people to work with it, is akin to an excellent orchestra playing on the sinking *Titanic*" (p. 47). Clearly, even with the most advanced software, organizational success with BPM initiatives would not be possible without motivated employees and managers who work to implement changing processes.

Studies have shown a possible gap between the supplied and demanded competencies in the BPM field, such that not all employees in the field have the competencies that are required for improving business processes (e.g., Bandara et al., 2010; Gartner, 2008). However, this issue has received little attention in academic research. Identifying the individual competencies that are demanded and supplied in the BPM field is a prerequisite to revealing and then addressing this competence gap. Two studies investigated the competencies demanded in the BPM field and those supplied by BPM professionals.

In the first study, BPM competency requirements were examined by analyzing a set of 1,507 BPM-related job advertisements collected from the *Monster* global online job platform (www.monster.com/about; Müller, Schmiedel, Gorbacheva, & vom Brocke,

2014). The second study identified the competencies offered by 10,405 BPM professionals by analyzing their profiles published on the LinkedIn professional online social network (www.linkedin.com; Gorbacheva, Stein, Schmiedel, & Müller, 2016). The Latent Semantic Analysis (LSA) text-mining technique was applied to the data analysis in both studies (e.g., Evangelopoulos et al. 2012; Debortoli et al. 2015; Müller et al. 2016). This note shares the results of these studies, compares their findings, and provides recommendations for BPM educators and future BPM professionals.

The Demand Side: Studying 1,507 BPM-Related Job Advertisements on *Monster.com*

The study on individual BPM competency requirements (Müller et al., 2014) analyzed 1,507 BPM-related job advertisements collected from the *Monster* online job platform in February 2012 using the LSA method. Seven categories of competencies, each of which contain competency sets that often occur together in BPM-related job advertisements, were identified (Table 1, abbreviated as [D1]-[D7]). These categories of competencies include *Business Process Analysis* [D1]; *Business Process Compliance Management* [D2]; *Business Process Management Sales and Marketing* [D3]; *Business Process Improvement Management* [D4]; *ERP (Enterprise Resource Planning) Solution Architecture* [D5]; *IT-Business Strategy Management* [D6]; and *Technical Architecture* [D7]. As the sets of competencies in each of the categories reflected the demand for competencies in the BPM labor market, a candidate who has any one of these sets of competencies would have a better chance of gaining and retaining employment than would a less qualified candidate.

Table 1 Categories of competencies demanded in the BPM field

Category of demanded competencies	Description of typical competencies	Nature of predominant competencies with examples of representative descriptive terms (stemmed)
[D1] Business Process Analysis	Related to the alignment of business and IT, including detection, analysis, documentation, and communication of user requirements, as well as design of corresponding business processes and IT systems	<i>Management</i> : ‘project’, ‘lead’, ‘ensur’, ‘success’ <i>Social</i> : ‘stakehold’, ‘communic’, ‘collabor’, ‘interview’ <i>Problem-solving</i> : ‘elicit’, ‘user’, ‘specif’, ‘issu’ <i>Development</i> : ‘document’, ‘map’, ‘model’, ‘architecture’, ‘design’
[D2] Business Process Compliance Management	Related to the analysis of regulatory requirements and ensuring the compliance of business processes and IT systems	<i>Domain</i> : ‘monitor’, ‘complianc’, ‘standard’, ‘intern’, ‘control’, ‘audit’, ‘polici’, ‘qualiti’ <i>Management</i> : ‘coordin’, ‘plan’, ‘perform’, ‘administr’, ‘report’
[D3] Business Process Management Sales and Marketing	Related to the design of sales processes, analysis of requirements for related IT systems, and support and execution of sales and marketing processes	<i>Domain</i> : ‘key’, ‘account’, ‘service’, ‘deliveri’, ‘sale’, ‘market’, ‘product’ <i>Management</i> : ‘lead’, ‘project’, ‘consult’, ‘strategy’, ‘process’
[D4] Business Process Improvement Management	Related to the analysis, measurement, and continuous improvement of business process, such as through application of Lean or Six Sigma management	<i>Management</i> : ‘manage’, ‘process’, ‘business’, ‘project’, ‘lead’, ‘organ’ <i>Problem-solving</i> : ‘improve’, ‘lead’, ‘six’, ‘sigma’

	techniques	
[D5] ERP Solution Architecture	Related to the implementation of business processes in ERP systems	<i>Software:</i> 'SD' (sales and distribution), 'FI' (finance), 'MM' (materials management), 'PP' (production planning) <i>Development:</i> 'configur', 'implement', 'integr', 'test' <i>Domain:</i> 'suppli', 'chain', 'financ', 'order', 'product', 'manufactur' <i>Management:</i> 'lead', 'project', 'consult', 'provid', 'plan' <i>Social:</i> 'team', 'travel'
[D6] IT-Business Strategy Management	Related to aligning business and IT strategies, monitoring technological innovations, and identifying business opportunities	<i>Management:</i> 'strateg', 'plan', 'risk', 'resourc', 'recommend', 'decis', 'ensur', 'perform' <i>Social:</i> 'team', 'particip', 'share', 'activ', 'communic'
[D7] Technical Architecture	Related to the development and integration of hardware and software infrastructures	<i>Software:</i> 'oracl', 'java', 'net', 'framework', 'sharepoint', 'ibm', 'microsoft', 'SOA' (Service-oriented Architecture) <i>Development:</i> 'design', 'architectur', 'implement', 'configur', 'integr', 'test'

(Source: adapted from Müller et al., 2014)

Results show that BPM requires professionals with interdisciplinary sets of competencies that cover technical, business, and systems competencies.

The Supply Side: Studying 10,405 Profiles of BPM Professionals on LinkedIn

The study on the supply of individual BPM competencies (Gorbacheva et al., 2016) used the LSA method to analyze 10,405 profiles of BPM professionals on the LinkedIn professional online social network in November 2014. Twelve categories of supplied competencies were derived, as summarized in Table 2 (abbreviated as [S1]-[S12]). These categories of competencies include *Strategic Management* [S1]; *(IT) Project Management* [S2]; *Enterprise Architecture* [S3]; *ERP Solution Architecture (SAP)* [S4]; *ERP Solution Architecture (Oracle)* [S5]; *Software Development* [S6]; *IT Service Outsourcing* [S7]; *Business Intelligence* [S8]; *Auditing and Risk Management* [S9]; *Accounting and Finance* [S10]; *Supply Chain Management* [S11]; and *HR Management* [S12].

Table 2 Categories of competencies supplied by BPM professionals

Category of supplied competencies	Description of typical competencies	Nature of predominant competencies with examples of representative competencies
[S1] Strategic Management	Related to higher management qualifications	<i>Management:</i> business transformation, requirements analysis, change management, IT strategy, program management
[S2] (IT) Project Management	Related to certificates earned, work experience in such specialised groups as Project Management Office (PMO), as well as the competencies required to run	<i>Management:</i> project delivery, PMO, stakeholder management, project portfolio management

	projects from within a company or as an external consultant	
[S3] Enterprise Architecture	Related to general enterprise architecture	<i>Development:</i> business process design, SOA, organizational design, enterprise architecture, EAI (Enterprise Application Integration)
[S4] ERP Solution Architecture (SAP)	Related to specific knowledge of the SAP ERP system	<i>Software:</i> SAP R/3, SAP implementation, ABAP (Advanced Business Application Programming), SAP NetWeaver, SAP BW
[S5] ERP Solution Architecture (Oracle)	Related to specific knowledge of the Oracle ERP system.	<i>Software:</i> Oracle e-Business suite, Oracle applications, ERP, Oracle, Oracle HR (Human Resources)
[S6] Software Development	Related to those required to conduct software development projects, including certain programming languages, procedure models, and server platforms	<i>Development:</i> SDLC (Systems Development Life Cycle), requirements gathering, software project management, solution architecture, agile methodologies <i>Software:</i> Java, Visual Basic, Java Server Pages (JSP), Scrum, Waterfall
[S7] IT Service Outsourcing	Related to either offering a cloud solution or outsourcing a company's own IT landscape	<i>Domain:</i> service delivery, outsourcing, IT service management, IT outsourcing, Software as a Service (SaaS)
[S8] Business Intelligence	Related to aspects of analysing, storing, and maintaining corporate data, including technical and software-related competencies and conceptual competencies	<i>Problem-solving:</i> data analysis, data warehousing, ETL (Extract, Transform and Load), master data management <i>Software:</i> Business Objects, SQL (Structured Query Language)
[S9] Auditing and Risk Management	Related to types of auditing (internal, IT, financial) and knowledge about standards and governance mechanisms; such risk management competencies as security and disaster recovery	<i>Management:</i> internal controls, internal audit, enterprise risk management, IT audit, risk management <i>Domain:</i> USA GAAP (United States of America General Accepted Accounting Principles), ISO 27001 (International Organization for Standardisation), Sarbanes-Oxley Act
[S10] Accounting and Finance	Related to finances at the managerial, conceptual, or operative levels	<i>Domain:</i> financial modelling, financial analysis, financial reporting, corporate finance, managerial finance
[S11] Supply Chain Management	Related to supply chains on the source side, the production side, or the management side	<i>Domain:</i> supply chain management, supply chain, procurement, strategic sourcing, logistics
[S12] HR Management	Related to the organization of corporate human resources (human capital), particularly HR management, operative HR tasks, and changes in corporate culture	<i>Domain:</i> talent management, performance management, HR transformation, employee engagement, personnel management, culture change

(Source: adapted from Gorbacheva et al., 2016)

The study's results show that technical competencies (categories [S3]-[S7]) dominate the competencies supplied by BPM professionals.

The BPM Competency Gap

To classify, analyze, and compare the demanded and supplied competencies in the BPM field, the competency framework from Todd, McKeen, and Gallupe (1995) was used to divide the competencies into (1) hardware and software (technical) competencies, (2) domain, management, and social (business) competencies, and (3) problem-solving and development (systems) competencies. Thus, the alignment of business and technology, which is characteristic of the BPM field, is acknowledged in the framework.

Analysis of the seven categories of competencies demanded in the BPM field (Table 1) showed that they were related to all three types of competencies in Todd et al.'s (1995) framework—technical (except for hardware competencies), business, and systems competencies—but that they were usually specialized in one or two sub-types (e.g., management, domain, software). The comparison of the categories indicated major differences in their scope and focus, as some have one core competency area—for example, the IT-Business Strategy Management [D6] category has a clear focus on business competencies—while others have an equal distribution of demanded competencies across the technical, business, and systems types. For instance, in the ERP Solution Architecture [D5] category, the representative descriptive terms were interrelated and equally distributed across software, development, domain, management, and social competencies.

Todd et al.'s (1995) was also used to analyze the twelve categories of competencies supplied by BPM professionals (Table 2) based on the nature of prevailing competencies in each category. Thus, the fit between supplied and demanded competencies in the BPM field could be explored. The results are presented in Table 3.

Table 3 Demanded vs. supplied competencies in the BPM field (applying the framework by Todd et al., 1995)

Technical	Hardware	Hardware competencies were not explicitly covered among either demanded or supplied competencies.
	Software	Software competencies were widely supplied and demanded, although on the supply side the focus was on ERP-related competencies.
Business	Domain	Domain-specific competencies were pervasive on both the demand and supply sides.
	Management	Management competencies were widely represented among both demanded and supplied competencies.
	Social	Social competencies, although in high demand, were underrepresented on the supply side.
Systems	Problem-solving	Problem-solving competencies were not supplied as prominently as they were demanded.
	Development	Supply of development competencies corresponded to their demand.

Although hardware competencies were not explicitly covered on the supply side, software competencies in such categories as ERP Solution Architecture (SAP) [S4], ERP Solution Architecture (Oracle) [S5], Software Development [S6], and Business Intelligence [S8] were pervasive. Among business competencies, domain-specific competencies were dominant in such categories as IT Service Outsourcing [S7],

Accounting and Finance [S10], Supply Chain Management [S11], and HR Management [S12]. Management competencies prevailed in the Strategic Management [S1], Project Management [S2], and Auditing and Risk Management [S9] categories. Social competencies were not widely supplied, and in the HR Management [S12] category, where some social competencies appeared, they were related to domain knowledge. As for systems competencies, development competencies appeared frequently in the Enterprise Architecture [S3] and Software Development [S6] categories, although problem-solving competencies appeared only in the Business Intelligence [S8] category.

Overall, although the competencies supplied by BPM professionals focused on technical, managerial, and domain competencies, the demanded competencies were more diverse. It can be argued that the supplied competencies did not fully reflect the holistic nature of BPM as described in, for instance, the BPM Six Elements Model from Rosemann and vom Brocke (2015). Most BPM professionals tagged *IT* or *software development* as their industry, and five of the twelve supply categories contained predominantly technical competencies (S3-S7). These findings indicate that the BPM field remains technical in practice, although, according to (for example) Hammer (2010, p. 3), IT is “at most a peripheral aspect of BPM.” At the same time, a lack of social and problem-solving competencies appears on the supply side. Whether BPM professionals did not indicate these competencies in their LinkedIn profiles because they did not have them or because they did not think they were important remains to be investigated.

Conclusion

This note presented and compared the results of two empirical investigations of the demanded and supplied competencies in the BPM field (Gorbacheva et al., 2016; Müller et al., 2014) and identified and discussed the gaps between the two. Seven categories of demanded competencies in the BPM field were derived from an analysis of more than 1,500 BPM-related job advertisements collected from the *Monster* global online job platform (Müller et al., 2014). Each category contained a combination of technical, business, and systems competencies, usually with a focus on one or two areas. The BPM job market at the time had a variety of open positions that demanded various sets of competencies. As for the supplied competencies in the BPM field, 10,405 profiles of BPM professionals published on the *LinkedIn* professional online social network were examined, and twelve categories of competencies were determined (Gorbacheva et al., 2016).

A comparison of the demanded competencies with the supplied competencies revealed that the supplied competencies were not as diverse as the demanded competencies, a finding that is in line with the findings of earlier studies (e.g., Bandara et al., 2010; Gartner, 2008). Specifically, the demanded problem-solving and social competencies were underrepresented on the supply side of the BPM job market. Clearly, BPM remains a technical field because *IT* and *software development* were predominantly mentioned as current occupation industries and technical competencies were listed in most of the LinkedIn profiles analyzed. However, since the supplied competencies were self-reported, additional analysis is required that uses, for example, interviews with BPM professionals to determine whether these competencies are actually lacking or were simply not listed. These professionals may see social competencies as unimportant and not worth reporting in their LinkedIn profiles.

Results of the studies might guide the professional development of those who already work in the BPM field or seek to enter it. BPM professionals, educators, and both secondary-school and university students should be aware of the BPM-related competencies that employers demand, especially those underrepresented on the current labor market. These competencies should be seen as promoting employability and the gaps in these competencies might motivate students to pursue a career in BPM and help to close the BPM competency gap.

BPM educators should ensure that BPM curricula teach a holistic set of competencies, which may require that existing university education programs on BPM be adjusted and/or extended. Furthermore, raising educators' awareness of an unsatisfied demand for qualified BPM professionals might lead to the development of new BPM academic programs, as only ten are currently available worldwide (www.bptrends.com/resources/bpmacademicprograms)

BPM professionals who lack some of the demanded competencies will find that participating in training programs to obtain them increases their employability, and those who have already mastered the demanded competencies should ensure that they communicate them in their curriculum vitae and public profiles on professional online social networks.

Acknowledgements

Many people and institutions contributed to the findings presented in this note. First and foremost, we thank our colleagues Theresa Schmiedel (University of Liechtenstein), Oliver Müller (IT University of Copenhagen), and Armin Stein (University of Muenster) with whom we conducted this research. Second, we are also grateful for the strong support from Stefan Debortoli, Co-Founder of the Text Mining Cloud Service MineMyText.com, for his great support, which has been instrumental for this research."

Authors

Elena Gorbacheva



Elena Gorbacheva completed her PhD in 2016 at the University of Muenster (Muenster, Germany). Elena holds BSc and MSc degrees in Business Informatics from the State University – Higher School of Economics (Moscow, Russia) and a MSc degree in Information Systems (IS) from the University of Muenster. In her PhD thesis Elena addressed existing challenges in the Business Process Management (BPM) workforce, focusing on the BPM competence gap, the under-representation of women in the field, as well as under-theorization and immaturity of gender and BPM research. Her work was published in the Business and Information Systems Engineering Journal, Enterprise Information Systems Journal, Australasian Journal of Information Systems, Communications of the Association for Information Systems, and several IS conferences. Elena was awarded the Leoni Warne Prize for Outstanding Publication in the Area of Women and IT in 2014 and the AIS (Association of Information Systems) Doctoral Student Service Award in 2015.

<http://erc.is/p/elena.gorbacheva>

Jan vom Brocke



Jan vom Brocke is head of the BPM group in Liechtenstein. He is Professor of Information Systems, the Hilti Chair of Business Process Management, and Director of the Institute of Information Systems. He is Founder and Co-Director of the *International Master Program in IT and Business Process Management* and Director of the *PhD Program in Information and Process Management* at the University of Liechtenstein (see: www.bpm-eduction.org). Since 2012 he has been appointed Vice- President of the University of Liechtenstein responsible for research and innovation. Jan has over 15 years of experience in IT and BPM projects and he has published more than 200 papers in renowned outlets, including *MIS Quarterly (MISQ)*, the *Journal of Management Information Systems (JMIS)* and the *Business Process Management Journal (BPMJ)*. He has authored and edited 20 books, including *Business Process Management – Driving Innovation in a Digital World* and *Green BPM – Towards the Sustainable Enterprise*, and the *International*

Handbook on Business Process Management. Jan is an invited speaker and trusted advisor on BPM serving many organizations around the world.

References

- Bandara, W., Chand, D. R., Chircu, A. M., Hintringer, S., Karagiannis, D., Recker, J., ... Welke, R. J. (2010). Business Process Management Education in Academia : Status, Challenges, and Recommendations. *Communications of the Association for Information Systems*, 27, 743–776.
- Debortoli, S., Junglas, I., Müller, O., & vom Brocke, J. (2016). [Text Mining For Information Systems Researchers: An Annotated Topic Modeling Tutorial](#). *Communications of the Association for Information Systems (CAIS)*.
- Evangelopoulos, N., Zhang, X., & Prybutok, V. R. (2012). Latent Semantic Analysis: five methodological recommendations. *European Journal of Information Systems*, 21, 70–86.
- Gartner. (2008). Gartner Says Most Organizations Lack All the Skills Needed to Implement and Optimize Their Business Processes. Retrieved November 24, 2014, from <http://www.gartner.com/newsroom/id/767412>
- Gorbacheva, E., Stein, A., Schmiedel, T., & Müller, O. (2016). The Role of Gender in Business Process Management Competence Supply. *Business and Information Systems Engineering (BISE)*, (58), 1–19.
- Hammer, M. (2010). What is Business Process Management? In J. vom Brocke & M. Rosemann (Eds.), *Handbook on Business Process Management 1 - Introduction, Methods, and Information Systems* (2nd ed.). Berlin, Heidelberg, New York: Springer-Verlag Berlin Heidelberg. doi:10.1007/978-3-642-00416-2
- Kokkonen, A. B. (2014). *Expertise in the Illustrative Context of BPM*.
- Müller, O., Junglas, I., vom Brocke, J., Debortoli, S. (2016), [Utilizing Big Data Analytics for Information Systems Research: Challenges, Promises and Guidelines](#). *European Journal of Information Systems (EJIS)*, online first.
- Müller, O., Schmiedel, T., Gorbacheva, E., & vom Brocke, J. (2014). [Towards a typology of business process management professionals: identifying patterns of competences through latent semantic analysis](#). *Enterprise Information Systems*, 1–31. doi:10.1080/17517575.2014.923514
- Rosemann, M., & vom Brocke, J. (2015). [The Six Core Elements of Business Process Management](#). In *Handbook on Business Process Management 1* (2nd ed., pp. 105–122). Springer-Verlag Berlin Heidelberg. doi:10.1007/978-3-642-00416-2_5
- Todd, P. A., McKeen, J. D., & Gallupe, R. B. (1995). The Evolution of IS Job Skills: A Content Analysis of IS Job Advertisements from 1970 to 1990. *MIS Quarterly*, 19(1), 1. doi:10.2307/249709
- vom Brocke, J., & Rosemann, M. (2015). *Handbook on Business Process Management 2: Strategic Alignment, Governance, People and Culture*. (J. vom Brocke & M. Rosemann, Eds.) (2nd ed.). Springer-Verlag Berlin Heidelberg.