Exploring Functional Affordances and Sensemaking in Human Resource Analytics

Full Paper

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Abstract

Interest and investment in Business Analytics (BA) have grown substantially the last decade and applying BA in the domain of Human Resource Management (HRM) has received much attention from practitioners. An increased understanding of what potential HR Analytics has and how this potential is recognized and used is of practical and academic importance. Using the lenses of Functional Affordances and Sensemaking from Information Systems (IS) literature, an explorative case survey is performed. Cases from conferences and publications are qualitatively analyzed. Twelve Functional Affordances of HR Analytics were identified along with exemplary Sensemaking Frames and Sensemaking Patterns.

This explorative study provides insights into the Functional Affordances and Sensemaking mechanisms of HR Analytics on an organizational level. It contributes to prior IS research in terms of the potential use of HR Analytics and the Sensemaking mechanisms used to identify and develop these affordances.

Keywords

Functional Affordances, Sensemaking, Frames, Patterns, Human Resource Analytics

Introduction

Business Analytics (BA) has been studied in various business domains. In this paper the focus is on BA in the Human Resource Management (HRM) domain, also called Workforce Analytics, People Analytics, Talent Analytics or HR Analytics. HR Analytics seems to be the most frequently used term although agreement on a commonly accepted term is still emerging (Marler & Boudreau, 2017). In this study the term HR Analytics will be used.

HR Analytics aims to create business value using people or HRM related work practices and policies in areas like recruitment, workforce engagement, workforce planning and retention. In practitioners' literature and conferences HR Analytics has received much attention highlighting case studies using specific analytic practices. In academic HRM research the subject of HR Analytics has gained some attention (e.g. Dulebohn & Johnson, 2013; Faletta, 2014) but research and evidence on HR Analytics and its linkages to organizational performance is sparse (Marler & Boudreau, 2017). In Information System (IS) literature HR Analytics has received little attention. Johnson et al. (2016) argue that there is "a great opportunity for HR and IS scholars to work together to develop a systematic program of research on the DSS in the context of HRM decisions".

Against this background, this paper aims to explore the potential of HR Analytics and through what mechanisms this potential is enabled. In this paper the focus is on the concept of Functional Affordances to explore the potential of HR Analytics and on the concept of Sensemaking to explore enabling mechanisms of this potential. The Functional Affordances lens is adopted as it is a frequently used perspective in IS research to study the use and effects of IT artifacts. The Sensemaking lens is adopted as

it provides a useful perspective to operationalize processes or mechanisms of insight generation and decision-making during data analysis activities (Lycett & Marshan, 2016).

A better understanding of the process of generation of insights (or making sense) is important for understanding how BA leads to improved performance (Sharma et al., 2014). Identifying the action potential of HR Analytics and their enabling sensemaking mechanisms, can shed light on the impact of using HR Analytics and can inform practice on how to leverage BA technology and practices to improve HRM practices and policies.

The research question in this paper is:

What are the Functional Affordances of Business Analytics with regard to Human Resource Management oriented work practices and what Sensemaking mechanisms are used to identify and develop these Functional Affordances?

In this study the organization will be the level of analysis as opposed to the individual level, whilst realizing that individual sensemaking efforts contribute to organizational sensemaking efforts.

Theoretical Background

Business Analytics and HRM

Holsapple et al.'s (2014) synthesized the definitions from multiple research perspectives into the following definition of BA: "BA is the evidence-based problem recognition and solving that happen within the context of business situations". These authors argue that sensemaking plays an important role in the problem recognition and solving activities when using BA. Sharma et al. (2014) describe the heritage and traditions of BA research and argue that areas like sensemaking are important topics for the future research agenda (Sharma et al, 2014).

There are many HRM related work practices and in literature various ways of defining and listing these practices can be found. Ulrich & Dulebohn (2015) summarized 'HR Practices' into four clusters: People, Performance, Information and Work. People refers to HRM work on the flow of people in, through, and out of the organization and includes an array of HRM Practices around workforce planning, staffing, training, development, and retention. Performance refers to HR work with a focus on performance management, setting standards, measuring performance, allocating rewards, and offering feedback. Information refers to HR work with a focus on the flow of information from top to bottom, inside to outside, and side-to-side within an organization. Work refers to HRM work with a focus on how the organization gets work done (e.g., through teams), workforce policies, and physical settings.

In each of the HRM work practices, BA can play a role in insight generation and decision support. Sharma et al., (2014) argue that insights emerge out of an active process of engagement between analysts and business managers using the data and analytic tools to generate new knowledge. A better understanding of the insight generation process when using BA, within the existing structures and processes of an organization, is important for the understanding of how the use of BA can lead to improved performance (Sharma et al., 2014). An exploration of the enabling Sensemaking mechanisms that are used to identify and develop the potential of HR Analytics initiatives is the focus of this paper.

Functional Affordances

The theoretical lens of Functional Affordances has gained renewed interest in IS research as it integrates technical and social aspects of technical objects or IT artifacts. Functional Affordances are the result of the interaction between a technical object and a goal-oriented actor or actors. Markus & Silver (2008) argue that technical objects or artifacts can be real things or abstract things like the outputs of information systems. Strong et al. (2014) define Functional Affordances as "the potential for behaviors associated with achieving immediate concrete outcome and arising from the relation between an artifact and a goal-oriented actor or actors". Functional Affordances are not only about actual use or realized action but also refer to potential use of an artifact (Markus & Silver, 2008). According to this perspective the identification of Functional Affordances is useful to understand the action possibilities as perceived by actors or actor groups. Functional Affordances can be examined on an individual level but also on an

organizational level (Strong et al., 2014). These authors argue that Functional Affordances on an organizational level are enabled by organizational goals and outcomes. Leonardi (2013) studied affordances on group level and called these shared affordances. So far, there have been very few studies on the Functional Affordances of BA, e.g. Glowalla et al. (2014) on transition from legacy to a new BA system and Wieneke et al., (2016) on customer-oriented work practice. Studies on Functional Affordances of HR Analytics have not been found during the study of this paper.

Cao & Duan (2015) distinguish between basic affordances (the enabling conditions for decision-making) and decision-making affordances. The latter are defined as the possibilities for data-driven decision-making, adapted from Markus and Silver 2008 and Strong et al. 2014. Decision-making affordances include identifying problems and opportunities, defining strategic objectives and criteria for success, developing and evaluating alternatives, and prioritizing and selecting one or more alternatives. The Functional Affordances perspective with respect to decision-making through BA, will be used to examine the action possibilities of HR Analytics on an organizational level.

It should be noted that, although the Functional Affordances perspective is seen as a useful perspective to study interaction between IT artifacts and users (Leonardi, 2013), more research is needed to further develop the concepts, mechanisms and their empirical examination that are primarily based on single case studies (Cao & Duan, 2015).

During the perception and actualization of Functional Affordances, information from IT artifacts, users or user groups and external and internal information is used (Bernhard et al., 2015). Lycett & Marshan (2016) regard the use of information for noticing, interpretation and acting as part of Sensemaking processes or mechanisms. This Sensemaking perspective is used to examine the mechanisms of identification and development of Functional Affordances.

Sensemaking

Sensemaking is often associated with processing large and complex amounts of data obtained from multiple sources (Lycett & Marshan, 2016). These authors summarized Sensemaking in literature and distinguish three perspectives: the (Strategic) Organizational, the Enacted and the Computational sensemaking perspective. (Strategic) Organizational literature, with Weick (1995) as foundational author, views sensemaking as a continuous retrospective process where people generate their own understanding and interpretations of certain situations. Beliefs, implicit assumptions, stories from the past contribute to forming an acceptable understanding or sense that is described with rules and words. The Enacted Sensemaking Perspective examines how individuals use interaction to create meaning. The Computational Sensemaking Perspective seeks to operationalize the sensemaking phenomenon as a process. In the latter perspective, Lycett & Marshan (2016) distinguish a naturalistic stream studying the cognitive capability of humans by tracing the 'paths' they use to form sense out of people's experiences (using heuristics, cues and hypotheses) and a second (related) stream in which the Data/Frame theory (Klein et al., 2007) views the sensemaking process of people through constructing a basic frame that allows them to create a view on a problem. This frame can be further developed by adding details and questioning explanations thus preserving, elaborating or rejecting the frame in cycles (Moore & Hoffman, 2011).

Faisal et al. (2009) elaborated on the Data/Frame theory of Klein et al. (2007) and developed a classification of representations of frames for sensemaking: subjective lenses through which people view, filter and structure data. The type of representation or frame can be influenced by factors like the goals, tasks, data, vested interests, past experiences and knowledge. Different representations can be created in different situations and contexts. The representation of the frames can be used to identify the frames that are used by actors. Faisal et al. (2009) distinguish the following frames: Spatial (depicting objects in a spatial relationship), Argumentational (relating multiple ideas through argumentation to make inferences), Faceted (a set of entities with a set of properties), Hierarchical (organizing elements in asymmetric one-to-many relations), Sequential (depicting movement of elements based on a predefined order such as time) and Network (items linked in many-to-many relationships).

Lycett & Marshan (2016) synthesized sensemaking literature in a conceptual sensemaking framework in which a Frame-of-Reference is defined as "a schema that contains and connects cues and, in addition,

contains the hypothesis/hypotheses about the problem under investigation". In their model, the sensemaking process starts with noticing (process of cues extraction), then, interpretation (process of structuring cues, developing hypotheses and selecting courses of action) and actions (bases on interpretations). The Frame-of-Reference is in the center of the model and is subject of a dynamic inner loop of questioning, elaborating and reframing.

Orlikowksi & Gash (1994) articulated a socio-cognitive perspective in IT research with the concept of Frame-of-Reference in the center to describe knowledge structures derived from knowledge and experience and include the assumptions, expectations, and knowledge used to understand technology in organizations. Other authors also used the concept of (technological) frames in empirical studies, e.g. Davidson (2002) and Young et al. (2016). These authors found that frames play an important role in IT-enabled change.

For this study the concept of Sensemaking Frames seems a useful perspective as it can assist in identifying *process steps as mechanisms* of sensemaking. Faisal et al.'s (2009) classification of Sensemaking Representations (or frames) will be used to identify and explore the variation in Frames-of-Reference used in HR Analytics.

Social mechanisms play an important part in sensemaking (Cecez-Kecmanovic, 2004). Using a Knowledge Management and primarily social perspective, Cecez-Kecmanovic (2004) developed the Sensemaking Patterns Framework adopting Weick's (1995) ideas of sensemaking and distinguishes the following sensemaking patterns: individual (intra subjective: through individual ideas and beliefs), collective (inter subjective: meanings created through intentional social interaction), structural (generic subjectivity: structures implied by constructed social reality) and cultural (extra subjective: the cultural environment of the organization). The Sensemaking Patterns Framework of Cecez-Kecmanovic (2004) will be used in this study to identify the *social mechanisms* of sensemaking.

In this study Sensemaking Patterns and Sensemaking Frames as described and discussed above, are regarded as mechanisms in the interaction between BA artifacts and users or user groups. This interaction can lead to Functional Affordances.

Research Approach

Research Design

The aim of this paper is to explore the Functional Affordances of HR Analytics and the mechanisms through which they are identified and developed. As little theory on Functional Affordances of BA in general and in HRM specifically is available, an explorative case survey is done. A case survey involves systematic collection and coding of case studies in which preference is given to the case characteristics rather than original authors' analysis and conclusions and to learn from many case studies (Yin & Heald, 1975). Case surveys are particularly suitable when case studies dominate an area of research, when the unit of analysis is the organization, when a broad range of conditions is of interest and when an experimental design is not achievable (Larsson, 1993).

As this study of an explorative nature, a qualitative design was chosen to examine Functional Affordances in a broad array of cases. Moreover, there is little research available on the studied phenomenon that could provide factors that could be used to test these factors statistically.

Data Collection

For the purpose of this explorative case survey, a database of an appropriate sample of cases (n=96) featuring HR Analytics was collected from scholarly and practitioner sources. Practitioner sources were included as they provide a rich source of examples from practice on the use of HR Analytics and to give breath to the exploration. Cases were collected from conferences, academic databases and web search.

The researcher attended five conferences (practitioners and academic) to get presentations and verbal explanations of a number of case accounts. In addition, a number of semi-structured interviews (n=9) were performed. For the academic database search, relevant search terms were identified in which HR terms (e.g. workforce, talent, HR, people) were used *together* with analytics terms (e.g. analytics, big data,

business intelligence) and terms to identify case studies (e.g. case study, case description, case presentation). Primary business and psychology databases were searched for peer-reviewed papers published since 2000, using EBSCO online databases. Practitioner sources were searched with the search engine Google using the same search terms as in the academic database search.

Inclusion criteria to compose the sample (Yin & Heald, 1975) were: the case documented the use of HR Analytics to create business value and the case narrative provided sufficiently enough rich data. Lack of richness of the narrative, and not using HR Analytics to create business value, were the exclusion criteria. This resulted in 36 cases from academic peer reviewed publications, 29 cases from non-peer practitioner sources (like journal articles, book chapters, white papers, web posts) and 31 cases from conference presentations mentioned above. The cases covered a variety of industries and contexts.

Data Analysis

The Functional Affordances were identified in the data by applying a three-step coding process as outlined by Miles & Huberman (1994). Atlas TI was used for coding quotations in the documents and for facilitating comparison of the codes in each document. First, quotations were identified containing text describing action possibilities from the use of HR Analytics and the outcomes. Secondly, candidate Functional Affordances were identified and formulated. Thirdly, after several iterations, candidate Functional Affordances were clustered into the four categories of HRM work practices of Ulrich & Dulebohn (2015). Candidate Functional Affordances were compared per functional subdomain, which led to a reformulation of the Functional Affordances. Documents and coding were analyzed and cross-compared in multiple cycles. Word tables were created in Excel with examples of quotations.

The Sensemaking Frames-of-Reference and Sensemaking Patterns in the cases were analyzed using selective coding. The taxonomies for Sensemaking Frames-of-Reference (Lycett & Marshan, 2016; Faisal et al., 2009) and Sensemaking Patterns (Cecez-Kecmanovic, 2004) as outlined above were used as selective codes. Quotations in the documents were identified containing text that supported one or more of the taxonomy items mentioned above. Atlas TI was used for coding quotations in the documents and for facilitating comparison of the codes in each document. Documents and coding were analyzed and cross-compared in multiple cycles. Word tables were created in Excel with examples of quotations.

Findings

In Table 1 the twelve identified Functional Affordances of HR Analytics are given with exemplary Sensemaking Frames and Sensemaking Patterns identified in the cases.

Cluster HR Practices	Functional Affordance	Exemplary Case	Exemplary Sensemaking Frames used	Exemplary Sensemaking Patterns used
People	Identifying workforce sourcing needs and solutions to fulfill	The choice of a new business location in an emerging market was made, based on the analysis of the availability of talent (with the required competencies) that was critical to the business of a global technology company.	*Spatial* representations in maps with talent availability (on required competencies) across relevant regions, gathered from internal and external sources.	The talent availability maps were used as a reference model (*structure*) by the analytics team to discover the right locations to recruit and to engage in discussions with business managers.
	Identifying workforce learning & development needs	Decision to redevelop educational processes in an university to reduce withdrawal behavior of students, based on the identification of indicators of withdrawal behaviors and their correlation with certain employee/student experience	*Network* representations in diagrams depicting the relations between indicator variables of employee/student experiences and withdrawal factors.	The network diagrams were *collectively* built in a series of staff and student workshops to identify the (in) formal processes and key indicators of student engagement and to discuss explanations and possible actions.

		measurements. This has led to insights into how the withdrawal process could be redeveloped to offer better support to "at risk" students.		
	Identifying relations between workforce and management factors and workforce engagement and well-being	Social network analysis using digital communication metadata (like email frequency, headers) and employee factors (like job title, locations, employee satisfaction) to predict team satisfaction. Identification of unhappy teams was used to alert (HR) managers to follow this up.	*Network* representations in diagrams depicting the communication networks in the organization. Faceted representation of data on email activity data (e.g. response time, size of network) in relation to employee satisfaction survey data (e.g. work-life balance, satisfaction with manager) aggregated to the manager level.	A practice was developed with tools (containing new digital data) and methods (machine learning, social computational). This was used as a reference practice (*structure*) that was used to investigate various questions. The network diagrams and faceted tables were used to *collectively* discuss and predict team satisfaction and, together with HR teams, take actions on unhappy teams.
	Identifying potential successors for key positions	Identification of potential successors for specific key positions in the organization based on analyses of people profiles (e.g. knowledge, experience, competencies and psychometric assessments) and output-based job profiles (objectives, stakeholders, challenges, required competencies). More than 80% of the movements in key positions came from this succession planning.	Structured *argumentational* representation in a succession and development framework depicting the plotting of people profiles with job profiles.	The succession and development framework was used as a reference model (*structure*) to plot people/job combinations and were used in management team discussions to identify potential successors for specific key positions and to identify and discuss employee development actions.
Performance	Identifying relations between workforce and leadership factors and specific business outcomes	Identification of gaps in workforce levels (per category) through projections of scenarios. It revealed that without adjusted hiring, promotion and retention of women the organization would not achieve its growth objectives.	*Spatial* representation of workforce data in internal labor maps depicting the flow of specific categories (e.g. gender) of employees in and out of the organizations.	The labor maps were used as a reference model (*structure*) to identify the impact of flow of workforce segments, their impact (e.g. growth projections) on business objectives and to *collectively* develop actions (e.g. adjusted hiring volume and composition) in discussions with management.
	Identifying opportunities for business performance improvement	Cost-driven workforce planning during merger & acquisition of a new business using a real-time dashboard of selected workforce cost metrics that enables the identification of cost drivers, variances from plan and scenario analyses of identified business improvement opportunities.	*Faceted* representation of selected workforce cost metrics per e.g. time period, unit, role or other segmentation in a real-time dashboard with current cost and projected future cost (case# P2, 8).	The real-time dashboard was developed and used as a reference model (*structure)* for scenario projections for the identification and realization of cost reduction possibilities in discussions with senior management. Analytic leadership and *culture* was driving the development of analytic tools and methods.

	Identifying the impact of specific HR policies & practices on business outcomes	Assessing campaigns to reduce sickness and absence using real-time dashboards and graphs showing the impact of reduction activities.	*Sequential* representation of the development of metrics over time in graphs and dashboards for selected areas e.g. sickness and absence.	The graphs and dashboards were developed and used as a reference model (*structure*) in HR management teams to *collectively* monitor, interpret and adjust the impact of specific initiatives e.g. on sickness reduction.
Information	Defining strategic objectives and monitoring execution	Development of a HR strategy with HR targets and metrics derived from strategic business objective.	*Hierarchical* structured representation of HR targets and metrics per strategic business objective.	The metrics were used as a reference model (*structure*) to engage with business stakeholders for the development and to get acceptance.
	Identifying the impact of (leadership) communication	Identification of 'having meaningful work' as a key driver of employee engagement. This was used in communication, sharing and coaching initiatives about positive and meaningful work experiences. This led to higher pride and work satisfaction and lower turnover.	*Faceted* representation of results in tables and graphs with percentages agreeing per question asked and clustered by category. Exemplary quotations from interviews were added.	The graphs and tables were used as reference models (*structure*) for the discovery of patterns and to convince senior leadership to invest in communications campaign.
	Identifying risk and compliance exposures	Identification of risk exposures and training compliance using training effectiveness metrics.	*Faceted* representation of data in tables on incidents (e.g. type, frequency, location) and training compliance and training effectiveness metrics depicted in a risk framework.	The tables were incorporated in a risk management framework that was used as a reference model (*structure*) to document, monitor and to communicate with central and local management to manage compliance and risk exposures.
Work	Identifying opportunities for business processes improvement	Identification of business improvement opportunities through a value chain analysis based on Activity Based Costing (ABC) of the quantified personnel contribution (quality and costs) in production processes. This led to development and prioritization of improvement actions like Six Sigma projects.	*Hierarchical* representation of data in tables and graphs per e.g. (sub) process, job, skill set, unit using a structured method (Activity Based Costing) to quantify employee activities in business processes for value chain analysis.	The method of analysis (ABC) with its tables and graphs were used as reference models (*structure*) in discussions with local management to *collectively* interpret results and develop and prioritize improvement actions like Six Sigma projects.
	Identifying relations between job and organization factors and specific business outcomes	Identification of the causes of business issues like new-hire turnover through the analysis of multiple job components (work schedules, tasks) and HR factors (skills, experience), gathered through surveys and on site job analysis and measurement.	*Faceted* representation of data in tables and graphs on multiple job components (work schedules, tasks) and HR factors (skills, experience), gathered through surveys and on site job analysis and measurement.	The tables and graphs were used as reference models (*structure*) in discussions of HR and line managers to *collectively* discover relations between HR factors and job and business issues like new-hire turnover.

Table 1. Functional Affordances, exemplary Cases, exemplary Sensemaking Frames and Sensemaking Patterns in HR Analytics

Discussion and Concluding Remarks

The contribution of this explorative study is fourfold. First, it has provided insights into the Functional Affordances of HR Analytics on an organizational level. This contributes to IS and BA research in which the HRM field has received little attention. The identified Functional Affordances of HR Analytics are a first classification. Further research is needed to further develop and validate this classification.

Second, the study has provided insights in Sensemaking mechanisms used in HR Analytics. Research in the field of Sensemaking is still primarily conceptual (Lycett & Marshan, 2016). This study provides practical examples of how Sensemaking mechanisms (frames and patterns) contribute to the identification and development of business value using HR Analytics.

Third, this research informs practitioners about the potential of creating business value with HR Analytics. Although the cases reflect examples of successful HR Analytics initiatives, many organizations still struggle to move from reporting to 'real' analytics and many organizations evaluate their HR Analytics capabilities as 'weak' (Bennett & Collins, 2015). Developing knowledge of and experience with a broad palette of Sensemaking frames and patterns can contribute to the improvement of HR Analytics capabilities.

Fourth, this study emphasizes that applying HR Analytics is undergoing a strong development. The examples given in this study are from the last decade. New ICT developments like social media, mobile devices, sensor-generated data and cloud technology give access to new categories of (un) structured data and have created new opportunities for HR to access and analyze new data categories, using new analytical methods like innovative algorithms and machine learning. More recent cases exemplify these new opportunities for HR Analytics.

Although no quantitative study was performed, a few tendencies from the cases can be observed. Many of the cases reflect a search by organizations to identify relations between different workforce variables and business outcomes to gain a better understanding of the complex domain of people and business outcomes. BA appears to be a valuable tool for that and HR Analytics is still developing. Although most cases account for BA initiatives of a primarily evaluative or decisional nature, more predictive or prescriptive initiatives can be seen in more recent cases and more are to be expected with the further evolution of BA technologies and methods. In most cases the main Sensemaking Frames could clearly be identified. It could be observed that the use of Faceted, Sequential, Hierarchical and Argumentational frames are frequently used in (statistical) methods to discover correlations between factors. Not many examples of Network or Spatial frames were found in the analyzed cases but this can be expected to grow as BA knowledge, experience and tooling evolves in HRM.

The use of HR Analytics in the organizations of the cases is evidently a social, organizational phenomenon. The data analysis, methods and Sensemaking Frames were used in various interactions like team discussions, workshops, presentations and meetings. Not only to discuss the results of the analysis and make decisions but also to gain broader perspectives, develop hypotheses and explanations, share beliefs and assumptions and gain acceptance for change management. Many cases underpin the importance of this social interaction for the quality and impact of BA in the organization. A number of cases also highlight the importance of an analytic culture in which evidence-based decision-making is an important aspect of creating value through HR Analytics and analytical leadership that is driving analytical processes and decision making.

This explorative study is subject to some limitations. First, although a large enough number of cases were examined to lead to saturation, generalizations cannot yet be made. Each of the cases has a specific context and more empirical qualitative and quantitative research is needed to develop hypotheses and empirically evaluate these. The cases examined in this study, give accounts of the actual use of HR Analytics on an organizational level. Studying the Functional Affordances and Sensemaking mechanisms on an individual level would give more insights to the factors that lead to sensemaking and thus impact the identification and development of affordances on an individual and organizational level. This could be beneficial to the use of HR Analytics in practice as this could be used to increase knowledge on potential sensemaking frames that can be used which will provide input for training of practitioners. In order to realize business benefits from the use of HR Analytics, the Functional Affordances need to be actualized through actions that lead to valuable outcomes. The path from the use of BA to realizing organizational

performance is complex one (Sharma et al., 2014). These authors conclude that the role of BA in decision-making processes and in the processes to convert decisions into value through organizational processes requires further research, in particular the organizational processes of decision making, resource allocation and resource orchestration.

The methods used in this study also lead to some limitations. Although triangulation was applied by using multiple types of data sources, an explorative interpretative study by a single researcher cannot lead to any generalizations. Further research as mentioned above is needed.

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