

Soft Skills, Attitudes and Personality Traits in Operations and Supply Chain Management: systematic review and taxonomy proposal through ProKnow-C methodology

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Abstract: The human factor impact on Operations Management (OM) and Supply Chain Management (SCM) performances is now more than ever acknowledged by both scientific research and industrial organisations, which are increasingly focusing on the assessment of the interplay between the human role and the achievement of high levels of competitiveness. Indeed, as a sign of interest in the subject, the trend of publications on the “Behavioural Operations Management” (BeOps) research field has seen a remarkable increase over the last five years. In this context, soft skills, personality traits, attitudes and behavioural skills are some of the elements and terms on which attention is being paid to understand how specific individual human aspects can lead to superior business performance and operational excellence. However, though several efforts have been made to identify and classify the different skills and attitudes required to successfully operate in the OM and SCM sectors, the difficulty in classifying and clarifying the meaning of the adopted terminology appears significant. Therefore, this paper aims to investigate the difference in vocabulary between “Soft Skills”, “Attitudes”, and “Personality Traits”, to clarify their adoption and main application areas and to propose a taxonomy for their usage within organisations. To achieve this objective, the “Knowledge Development Process method” (ProKnow-C) is applied to systematically analyse the scientific background on the abovementioned topic and carry out bibliometric and content analyses of the literature. An analysis of a portfolio of over 2000 articles allows to identify a comprehensive taxonomy for the BeOps field and lays the foundations for a systematized development of this research area, which tends to be unstructured and multifaceted.

Keywords: *soft skills, attitudes, personality traits, taxonomy, behavioural operations management*

1. INTRODUCTION

During the last decades, the Operations Management (OM) and Supply Chain Management (SCM) scientific and industrial research has been increasingly focusing on the human side of operations by considering behavioural and cognitive aspects within classic OM and SCM models. Since the publication of the pioneering work of Gino and Pisano [1], Behavioural Operations Management (BeOps) has grown considerably as an area of interest within the OM and SCM sectors. BeOps research has investigated numerous areas, covering topics such as: human biases, perceptions, and decision-making between individuals or groups. [2]. In addition, in the development of the BeOps sector, supply chain research was also deepened by starting to address the technical characteristics of these systems and the properties of individuals (e.g., soft skills, personalities, attitudes, etc.). However, though this research area has been rapidly developing in the last years, often OM practitioners only implicitly recognise the importance of human aspects and OM textbooks contain brief sections

on human factors (HF). Still, the topic is infrequently covered in OM and SCM research journals [3]. Indeed, although Human Resource Management (HRM) practices are strategic for operational excellence – see the paper of Neumann and Dul [3], which has proved the convergence of human and systems outcomes – they are still neglected in many contributions and models.

Though the BeOps scientific background includes many research streams, the evaluation and analysis of the professionals’ abilities are one of the most relevant streams, both in terms of scientific and industrial applications. Indeed, several works describe the relevance of the ability of individuals to influence the performance of an organisation [4], [5], which are considered to be the characteristics professionals have (e.g., competencies, skills, etc.) and how those qualities are put into practice to achieve business results. For instance, Stek and Schiele [6] show that different essential OM and SCM skills have been provided over the years, which can be summarised as hard or analytical and soft or personal. However, it is possible to observe

that much attention has been given to classifying and providing descriptions of hard skills, whereas, in the soft area, no clear taxonomy is present to describe these characteristics [6], [7]. This lack of a common and shared taxonomy results in an improper and unclear usage of the terms in the soft area of BeOps (i.e., “Personality traits”, “Soft Skills”, “Attitudes”), which are mistakenly used interchangeably in many contributions.

For this reason, the present work aims at performing a comprehensive analysis of the present contributions in the scientific background to provide a taxonomy to clarify the terminological difference between the terms “Personality traits”, “Soft skills”, and “Attitudes”. Indeed, these words are generally adopted to define specific human aspects and characteristics, though it seems that no clear and well-defined terminological distinction is present. To reach this objective, this research implements the “Knowledge Development Process-Constructivist” (ProKnow-C) methodology to select the appropriate bibliographic portfolio and perform a thorough analysis of the OM and SCM field contributions. Moreover, it is possible to observe that the research aligns with the need to improve awareness within the OM and SCM field concerning the importance of behavioural and cognitive factors in operational performance, following the suggestions of Gino and Pisano [1] to successfully contribute to BeOps research area.

The rest of the paper is organized as follows. First, the ProKnow-C methodology is briefly introduced and implemented to select the relevant bibliographic portfolio. Successively, the results are presented through the bibliometric and content analyses of the chosen bibliographic portfolio. Lastly, the taxonomy proposal is provided, along with a discussion of this research work's main findings and further developments.

2. THE PROKNOW-C METHODOLOGY

The main objective of this work is to clarify the meaning of three fundamental terms adopted for the description of individuals within organisations (i.e., “Personality traits”, “Soft skills” and “Attitudes”) and to allow for their proper usage in the Behavioural Operations Management field. To achieve this goal by proposing a comprehensive taxonomy, it is essential first to understand what has been developed in the current scientific literature and how these terms have been implemented. This would allow to understand their adoption and deduce the most common shared meaning of the terms.

An intervention tool with a constructivist philosophical basis, namely the “Knowledge Development Process – Constructivist” (ProKnow-C), has been exploited to accomplish this task. This method, also adapted in other works, see Dutra et al (2015) and Viera et al [9], is adopted to conduct an in-depth analysis of the literature and fill the gaps found. As also examined by de Carvalho et al. (2020), the method is comparable to the Methodi Ordinatio, providing an excellent structure for

conducting the systematic review of the scientific literature. The ProKnow-C methodology is a structured process for performing a literature analysis, first proposed by the contribution of Tasca et al. [11] and developed by the Laboratory of Multicriteria Decision Support Methodology - Constructivist (LabMCDA-C). A comprehensive literature analysis concerning the usage of the psychological terms in the BeOps field is performed and then adopted as the starting point for the taxonomy proposal. For a thorough description of the ProKnow-C methodology, the reader may refer to the contribution of Tasca et al. [11].

Briefly, the method starts from a set of axes, including search keywords, defines a database of articles (Bibliographic Portfolio) that, in different steps, goes on to analyse what has been produced until the definition of a restricted set of works that are then examined in depth to assess the literary gap that was to be read. Through the ProKnow-C application, significant contributions to the taxonomic definition are collected within the Bibliographic Portfolio (PB), which gathers the most scientifically relevant publications for this literature topic. The outcome of the PB analysis provides a mapping of the characteristics. It helps identify the scientific journals that have given space to publications on this topic, thus inferring a comprehensive taxonomy and a research agenda for this field.

A. Procedure for the Bibliographic Portfolio selection

The ProKnow-C methodology specifies several steps for the definition of an appropriate Bibliographic Portfolio, which forms the starting point to evaluate the state-of-the-art of the analysed field.

The first step of the procedure is given by selecting raw bank of articles, which involves: definition of keywords; definition of databank; search for the articles in the selected databank from the chosen keywords; and test of adherence of the keywords[12]. The Scopus and Web of Science (WoS) databases have been selected for extrapolating the identified articles. According to Harzing and Alakangas [13], they are the two most widely used academic databases globally, providing reasonably similar results. However, Brzezinski [14] explains that the Scopus database is advantageous because it indexes about 70% more sources than WoS, providing comprehensive coverage of the latest literature, including most of the papers available in the WoS database. Moreover, Harzing and Alakangas [13] show that Scopus usually presents higher citation levels in the Engineering field.

To define the taxonomy in BeOps, two axes have been defined to conduct the literature search. According to Table I, the first axis encompasses keywords concerning the Psychology field, such as soft skills, personality traits, and attitudes. Differently, the second axis investigates those words within the field of Operations and Supply chain management: operations management, manufacturing, supply chain, production, logistics,

maintenance, and transportation. The query submitted to extract the articles from the two databases is described as follows: (“soft skills” OR “personality traits” OR “attitudes”) AND (“operations management” OR “manufacturing” OR “supply chain” OR “production” OR “logistics” OR “maintenance” OR “transportation”).

By applying a time filter, considering only papers published since 2009, the total number of extracted articles was 5184, respectively: 2026 from Scopus and 3158 from WoS. In the next step, only Q1 journals have been included. By applying those filters, a Raw Primary Articles Portfolio consisting of 1022 contributions was created at this point.

TABLE I
AXES OF KEYWORDS

Axis 1: People dimensions	Axis 2: OM and SCM field
Soft skills	Operations management
Personality traits	Manufacturing
Attitudes	Supply chain
	Production
	Logistics
	Maintenance
	Transportation

In the next phase of applying the method, a filter of the obtained articles is realized. Duplicate articles are eliminated, and the article titles are analyzed by evaluating their alignment with the research subject. The duplicate papers identified were 94, defining papers at this point equal to 928. In proceeding with the detailed analysis of the titles and keywords chosen by the authors of the works, 885 contributions were excluded because they were not in line with the research theme. Most of the excluded articles explored green transportation and urban mobility behavioural considerations. After these phases of the ProKnow-C application, the resulting sample size was 65 articles. In the next phase, the abstracts of the papers were analyzed, this phase excluded 11, and the sample decreased to 54 articles. Finally, in the last filtering step, the remaining articles were read and examined to define which ones provided valuable insights into the research topic, resulting in a final value of 33. Hence, the full Bibliographic Portfolio comprises 33 articles, detailed in Appendix A.

B. Bibliometric analysis

Once the PB selection phase has been completed, the bibliometric analysis phase is carried out. For a group of articles, bibliometric analysis is conducted to provide quantitative data and manage and schematize the scientific contribution on a given topic. This activity is usually carried out by counting and analysing papers [11] and related metrics.

The trend of publications on this topic over the last 12 years is growing: 17 of the 33 reviewed articles have been published since 2017, providing further evidence of the growing interest in this area and the whole BeOps sector in general. Though the growing interest in this research area, surprisingly, during 2019 no contribution on this specific topic has been found.

Additionally, the analysis of major journals in terms of published contributions shows that 6 of the 25 journals represent 14 of the 33 total papers, namely approximately half of the PB. In particular, “International Journal of Operations and Production Management” and “The International Journal of Human Resource Management” constitute a representative sample of the pool of journals in which the articles are featured. The research areas in which the reviewed papers have been published are typically operations management and human resource management. A final consideration allows us to underline how high relevance journals in OM and SCM fields increasingly give space to topics such as the one examined (e.g., Procedia Manufacturing, Journal of Operations Management).

3. CONTENT ANALYSIS

The bibliometric analysis of the Bibliographic Portfolio allows understanding of the main contributors (i.e., authors, journals) to the specific research area. In contrast, the content analysis of the selected papers allows defining how those contributors dealt with the topics of interest, to provide a taxonomy based on the research state-of-the-art.

The dynamics of individuals in the OM and SCM context are examined in the PB using the terminology under evaluation, along with related diverse meanings. Moreover, as expected, the adoption of the terminology was not perfectly balanced among the different papers. In fact, the words “attitude” and “soft skills” have been presented in a more significant number of papers than “personality traits”.

In the following subsections, an analysis of the main contributions and meanings concerning a specific term (i.e., Personality traits, Attitudes, Soft skills) is reported.

A. Personality traits

People are analysed within the work context considering several aspects, one of which is personality traits. These are mainly treated within the selected PB by referring to the well-known psychological framework labelled as “Five-Factor Model” [16]. Personality traits represent for the different authors of the PB, distinctive characteristics of individuals that, in most cases, are assessed as challenging to change or influence (Witt and Baker, 2018). Such considerations result from how difficult it is to change characteristic traits of individuals and be able to measure them accurately.

Additionally, several works found that the reactions and performance of individuals are related to personality characteristics: for instance, the propensity to be anxious can be negatively or positively related to stress management [4], [15], [22]. Understanding the different traits of each person can not only influence their performance as workers but also improve the work of Human Resources (HR), which would then be able to suggest customized tools and methods according to the expected response of each worker [5].

C. Soft skills

A great deal of attention has been focused on the soft skills terminology over the last decade. The division arose to distinguish purely technical or hard skills from those skills manifested by individuals and not attributable to technical skills, which have therefore been named “soft”. As pointed out by the work of Grugulis and Stoyanova [20], there was a period until just before 2010 when the skills demanded by employers were purely hard, while later the demand for soft skills started to grow on the part of employers, thus generating a greater focus on soft skills. Several works support these considerations. For example, Witt and Baker [21] provide the five main characteristics of those who are Six Sigma Black Belt certified – namely: good leadership, change agent, effective communicator, team builder, is driven by results – and all of them are soft skills. The same reasoning is found in the recent work of Stek and Schiele [6], which analyses the main features of supply and purchasing managers and pieces of evidence that soft skills are “*essential antecedents to hard skills*” [6]. Finally, in several other works [19], [23], [24], soft skills are essential attributes for enhancing business performance.

D. Attitudes

In general usage by researchers and practitioners, the term attitude takes on rather vague connotations; however, when analysing its use within the PB’s contributions, a convergence of several authors on the same meaning arises. In 2013, for example, Mavrikios *et al.* [17] described the term as follows: “*“Attitude” is a hypothetical construct that represents the degree of an individual’s likes or dislikes of an item*”. A few years later, the contribution of Yang *et al.* [25] expressed a similar perspective concerning its usage: “*An attitude is an individual’s evaluative judgment of a psychological object that represents a tendency toward an object’s overall favorableness (e.g. good vs bad, beneficial vs harmful)*”. These authors represent the use of this term within the PB, finding, albeit with some slight differences, a convergence of thought in this regard, thus providing valuable food for thought for the taxonomic proposal that is presented in the next section. This type of representation is also identified in more recent works and, in general, in the various works that have touched on this subject in the PB [26]–[28]. The use of term “attitude(s)” is sometimes combined with the term “work”: the use of “work attitude” is used for describing the behaviour of employees in the workplace. This kind of term is often used to measure the impact of HR or management policies, since measuring the positive or negative attitude of employees provides a general measure of the quality of the workplace [4].

4. TAXONOMICAL PROPOSAL

Once the content analysis of the selected Bibliographic Portfolio has been carried out, it is now possible to propose a suitable taxonomy for the examined terminology in Behavioural Operations Management.

TABLE II
PROPOSED TAXONOMY

Term	Proposed taxonomy
Personality traits	The set of characteristics that distinguish the individual, cannot be changed in the short run regardless of place or context
Soft skills	The set of characteristics of an individual that enables him/her to translate his/her technical knowledge effectively and efficiently into the work context, which may naturally be present or may be learned over time
Attitudes	The set of characteristics that depend on an individual’s environment and influence the way a person manifests their personality traits and hard or soft skills

According to the definitions in Table II, personality traits represent the inner part of an individual and the connotations of its character. Examples are given by shyness, anxiousness, extroversion, introversion, etc. This set of connotations is independent of the context in which individuals are placed, whether at work or not, and is unlikely to change radically over time. Appropriately measuring these characteristics could help effectively allocate human resources in different work contexts. For example, someone who is introverted by personal traits is unlikely to be an effective communicator in public.

When we talk about soft skills, these are considered characteristics that allow individuals to efficiently express technical knowledge. Indeed, holding good technical knowledge but not being able to either communicate with others constructively or build a team reduces the impact an individual can provide more than significantly. Typically, team building, change management, and problem-solving characteristics can be learned or improved through experience and practice, even if at a slower pace than learning more hard knowledge. For example, an operations manager who knows how to accurately analyse efficiency losses of a production line but is unskilled in getting operators to improve due to a lack of communication skills may find several difficulties in improving the overall manufacturing performance.

Finally, attitudes constitute a third dimension that is typically dependent on where individuals are placed. Although a person may be characterised by several requirements in terms of personality traits, hard and soft skills, to adequately hold a certain job position, he/she may underperform because he/she has a negative attitude towards some dimensions of the workplace. For example, an individual who possesses all the characteristics to be a demand planner may not perform well when placed in a work context that reflects his/her ambitions and may perform inadequately. Furthermore, although attitudes can take on a variety of nuances, they are sometimes briefly connoted with the adjectives “positive/negative”.

In conclusion, the proposed taxonomy allows for a proper adoption and usage of this terminology in Behavioural Operations Management, significantly contributing to laying the foundations for the development of this research field. Moreover, the described terms allow for

building the foundation for the areas concerning the measurement of individuals and for developments in this direction.

A. Directions for future research

The research confirms that the BeOps field is still relatively new, and its structure and topics are still in full development. Several possible research directions could contribute to expanding this research field based on the content analysis of the PB [6], [16], [21]:

- firstly, the characteristics that fall under each of the three described macro-dimensions in this paper could be better clarified by also specifying their application areas;
- secondly, it would be interesting to extend this work by integrating it with what is defined in international standards;
- moreover, starting from the proposed taxonomy, other research works could investigate the most suitable characteristics to effectively work in the OM and SCM context;
- finally, measuring these dimensions could be a crucial step for an appropriate consideration of personality traits, soft skills and attitudes within the work context.

5. FINAL CONSIDERATIONS

The present work analyses three relevant dimensions for defining the characteristics of individuals within the research scope of Behavioural Operations, namely “Personality traits”, “Attitudes”, “Soft Skills”. The Knowledge Development Process-Constructivism (ProKnow-C) method has been chosen to select the state-of-the-art contributions to evaluate the terminology’s meanings and usages in the current scientific literature. Following the ProKnow-C methodology, a Bibliographic Portfolio was created containing the most suitable works to answer the research questions for the present work. A bibliometric and content analysis of the selected papers has then been performed, which led to the proposal of a comprehensive taxonomy for the selected terminology.

The proposed taxonomy contributes to widening the still growing territory of BeOps and, in particular, provides interesting hints for possible future developments. For example, it is possible to investigate the most suitable characteristics for certain roles within the OM and SCM field by adopting specific terminology. Further research may also attempt to develop a suitable method to test these characteristics appropriately. Finally, some limitations of this research should be observed. For instance, the subjectivity for the definition of keywords and research axes may impact the analysis outcomes. For this reason, future works on the taxonomic definition could consider the temporal evolution of the defined terms and/or widen the research pool of the selected keywords, research axes and journals.

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Appendix A. BIBLIOGRAPHIC PORTFOLIO

ID	Reference	Title	Journal	Year
1	[15]	Relationships between personality variables and burnout: A meta-analysis	Work & Stress	2009
2	[26]	The social benefits of kaizen initiatives in healthcare: an empirical study	International Journal of Operations & Production Management	2018
3	[18]	Perceptions of HR practices and innovative work behavior: the moderating effect of an innovative climate	The International Journal of Human Resource Management	2017
4	[19]	Clashing institutional interests in skills between government and industry: An analysis of demand for technical and soft skills of graduates in the UK	Technological Forecasting & Social Change	2017
5	[23]	Contextually enriched competence model in the field of sustainable manufacturing for simulation style technology enhanced learning environments	Journal of Intelligent Manufacturing	2011
6	[29]	The relationships between performance measures and employee outcomes: the mediating roles of procedural fairness and trust	Conference on Performance Measurement and Management Control	2014
7	[30]	The human side of humanitarian supply chains: a research agenda and systematization framework	Annals of Operations Research	2021
8	[31]	Resilience for lean organisational network	International Journal of Production Research	2018
9	[28]	Does people-related total quality management work for people? An empirical study of the Sri Lankan apparel industry	The TQM Journal	2021
10	[32]	What drives managers to insource production? Evidence from a behavioural experiment	Journal of Purchasing and Supply Management	2021
11	[20]	Skill and Performance	British Journal of Industrial Relations	2011
12	[4]	Causal relationship between HRM policies and organisational performance: Evidence from the Greek manufacturing sector	European Management Journal	2010
13	[33]	Person-organization fit and employee outcomes: test of a social exchange model	The International Journal of Human Resource Management	2013
14	[5]	High commitment HR practices, the employment relationship and job performance: A test of a mediation model	European Management Journal	2016
15	[34]	Teaching Industrie 4.0 technologies in a learning factory through problem-based learning: Case study of a semi-automated robotic cell design	Procedia Manufacturing	2020
16	[17]	On industrial learning and training for the factories of the future: a conceptual, cognitive and technology framework	Journal of Intelligent Manufacturing	2011
17	[35]	Transformational leadership and the work outcomes of Chinese migrant workers: The mediating effects of identification with leader	Leadership	2012
18	[36]	Does Dispositional Aggression Feed the Narcissistic Response? The Role of Narcissism and Aggression in the Prediction of Job Attitudes and Counterproductive Work Behaviors	Journal of Business and Psychology	2012
19	[24]	A Project-based Learning curricular approach in a Production Engineering Program	Production	2017
20	[3]	Human factors: spanning the gap between OM and HRM	International Journal of Operations & Production Management	2010
21	[37]	Corporate social and environmental irresponsibilities in supply chains, contamination, and damage of intangible resources: A behavioural approach	International Journal of Production Economics	2021
22	[38]	Examining the relationship between strategic HRM and hospital employees' work attitudes: an analysis across occupational groups in public and private hospitals	The International Journal of Human Resource Management	2016
23	[39]	Trust in organization as a moderator of the relationship between self-efficacy and workplace outcomes: A social cognitive theory-based examination	Manufacturing & Service Operations Management	2017
24	[40]	Field trips for sustainable transport education: Impact on knowledge, attitude and behavioral intention	The International Journal of Logistics Management	2018
25	[22]	Examining the frustration-aggression model among Tunisian blue-collar workers	Journal of Managerial Psychology	2015
26	[41]	How Employee Authenticity Shapes Work Attitudes and Behaviors: the Mediating Role of Psychological Capital and the Moderating Role of Leader Authenticity	Journal of Business and Psychology	2020
27	[6]	How to train supply managers – Necessary and sufficient purchasing skills leading to success	European Journal of Operational Research	2021
28	[16]	Do personal traits influence inventory management performance? -The case of intelligence, personality, interest and knowledge	International Journal of Production Economics	2013
29	[42]	Multiple dimensions of human resource development and organizational performance	Journal of Organizational Behavior	2014
30	[2]	Agent-system co-development in supply chain research: Propositions and demonstrative findings	Journal of Operations Management	2014
31	[43]	Leadership behaviors during lean healthcare implementation: a review and longitudinal study	Journal of Manufacturing Technology Management	2020
32	[21]	Personality characteristics and Six Sigma: a review	International Journal of Quality & Reliability Management	2018
33	[25]	Attitudes toward supplier integration: the USA vs China	International Journal of Operations & Production Management	2017