Dealing with the Challenge of Business Analyst Skills Mismatch in the Fourth Industrial Revolution

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Abstract. This paper describes the skills mismatch within the Business Analysis profession. The Business Analysis profession emerged in the early 90s and is still considered a new field in the information systems domain which has not been extensively researched. However, the advent of the Fourth Industrial Revolution has put the future skills of the profession into question. This paper uses the Business Analysis Competency Model to develop a proposed Skills Mismatch framework to understand the skills mismatch within the Business Analysis profession. The Business Analysis Competency Model highlights technical skills, business skills, analysis techniques, interpersonal skills, and the Business Analysis Methodology. The gap identified in the literature is that there are limited studies in the digital age that have tracked the changes in required skills over time. This paper will be useful to the Business Analysis Body of Knowledge by proposing a framework for addressing a possible Fourth Industrial Revolution induced skills mismatch.

Keywords: Skills mismatch · Business analyst · Fourth industrial revolution · Skills

1 Introduction

Technology is advancing at a rapid pace and the world has undergone numerous transitions in technological advancements which are commonly referred to as "Industrial revolutions". The Fourth Industrial Revolution (4IR) is defined as the "revolutionary change that occurs when Information Technology (IT) proliferates in all industries, that is, the primary, secondary, and tertiary industries" [1]. The 4IR is projected to make obsolete certain skills and create a mismatch between the current and future skills [2]. The 4IR is also predicted to result in significant job losses, automation of processes, and reduced need for human labour. Low skilled labour is mostly affected however high skilled labour will not be spared. The Business Analysis profession is impacted which may result in skills mismatch [3].

This paper firstly introduces the Business Analyst (BA) role and context. It then focuses on describing the current Business Analyst skills and those required for the 4IR and the disparities between them. The Business Analysis Competency model and factors that could reduce the mismatch are used to develop the proposed Skills Mismatch conceptual framework.

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2 Business Analysis

According to the International Institute of Business Analysis [4], business analysis is "the practice of enabling change in an organisational context, by defining needs and recommending solutions that deliver value to stakeholders." Paul and Tan [5] view business analysis as the bridge between business and IT. Yet the definition of the role of a BA is elusive resulting in confusion of the title, role, skills and required knowledge of a BA [6]. The business systems analyst, functional analyst, and systems analyst are all being employed in this role [7]. Not only is the position of the BA ambiguous, so are the skills, and competencies required for the job [8]. This lack of an agreed definition of the role of a BA creates conflicting skills expectations, a gap that requires further exploration.

2.1 Historical Context

The BA profession is a relatively young profession that developed in the 1990s and there is little evidence of its longevity [5]. Research has found that the business/systems analysts' skill requirements show the greatest change in longitudinal studies [6]. There is limited recognition within the academic community and little research that has been conducted into the historical BA skills and competencies.

2.2 Current Context

BAs play a pivotal role in the organisational success of any business [5]. The body of knowledge asserts that the need for BAs is predicted to increase in the future with an increase in technological developments [7, 9]. Yet the "BA profession is characterised by constant change and uncertainty, placing pressure on BAs to regularly update their skills"[10].

3 Business Analysis Skills

Park and Jeong [9] describe a skill as the ability one has, to perform a given task, achieve the recommended results using a related given amount of time and power. This is sometimes split into context general and context-specific skills [11]. The BA role definition is not consistent in literature [11]. Hence support for ascertaining the skills needed to fulfil the role has been expressed [6]. The Business Analysis Competency Model comprises domain, technical, business, and soft skills [9]. The IIBA have outlined the key competencies and techniques relevant for a BA and these are summarized in Table 1. They will now be described.

Table 1. BA competency model [12].

IIBA Business Analysis Competency Model			
Underlying Competencies	Knowledge Areas	Techniques	Proficiency Scale
• Tools and Technology • Analytical Thinking and Problem-Solving Behavioural Characteristics • Business Knowledge • Communication Skills • Interaction Skills	• Solution Evaluation • Business Analysis Planning and Monitoring • Elicitation and Collaboration • Requirements Lifecycle Management • Strategy Analysis • Requirements Analysis and Design Definition	• Agile • Information Technology • Business Architecture • Business Process Management • Business Intelligence • Business Data Analytics • Cybersecurity	• General Awareness • Practical Knowledge • Skilled • Expert • Strategist

3.1 Technical Skills

Technical skills are the ability to use technology tools and the technical knowledge surrounding the hardware, software and programming required to develop new or modified information [8, 13]. Technical skills entail specialised knowledge or a set of abilities that allows one to perform practical work and varies across industries such as science and IS [14]. There are two opposing thoughts in the literature on the need for technical skills; the first thought is that the BA professional must have technical skills due to the rapid pace of change while the second thought is that, advances in computer technology will lessen the need for technical expertise [15]. In their study of the IS industry between 2013 and 2018, Tan et al. [16] found that the need for technical skills remains high. BAs must therefore have technical skills to be successful in their role [9]. Recent technological advances require organisations to rethink the BA role [17]. IS services are highly technical, therefore technical skills are likely to remain relatively important [18].

3.2 Business Skills

Evans [8] defines business skills as "broad knowledge of business practices and knowledge of different functional areas within the organisation", and McGuinness et al. [13] extend the definition to include "the knowledge about the organisation's business processes". Business skills identified included business case development, stakeholder engagement and management, industry knowledge, business problem analysis and IS strategy evaluation [5, 16]. This matches with the IIBA competency model to a certain extent as BAs are expected to have knowledge in the Business domain as part of the requirements gathering process [6]. The position of an all-rounder BA who has overall business knowledge has research support [11].

3.3 Analysis Skills and Techniques

McGuinness et al. [13] describe analysis techniques as the application of knowledge management skills and methodologies in solving complex problems. BAs are responsible for "transferring requirements or information from users and developers, facilitating their ideas" [9]. In prior research [5] the ability to apply professional analytical techniques was highlighted as critical to the success of a BA [5]. This included requirements elicitation, business systems/processes modelling, and solution design.

3.4 Interpersonal Skills

Interpersonal skills relate to an individual's behaviours and attitudes, interpersonal communication, and group behaviour. Researchers opine that BAs must put the highest degree of importance in behavioural skills such as communication, negotiation, ability to challenge, and problem-solving, as these skills are critical in development teams [5, 8, 19]. Interpersonal skills have been viewed to be top skills and traits for entry-level IS workers as well as critical for the BA professional [14, 20]. Personal characteristics are perceived as "more valuable than technical skills and interpersonal skills and personal traits are more valuable than technical skills and organisational knowledge" [6].

3.5 Methodological Skills

The BA profession has been characterised by an evolution of the ways of work. The perception of the BA role is that of a professional that may be tasked with different activities from one project to another [21]. There is currently a transition from a single domain BA employing the waterfall-based delivery method towards a cross-functional multi-skilled BA working on an agile delivery methodology [16]. The dominant theme for the BA profession is an individual who can be adaptable to using different methodologies such as Waterfall, Agile, Lean, Six Sigma etc.

3.6 Skills Weightings

There are conflicting viewpoints in the literature with regards to the criticality of the relevant BA skill categories. There are varying opinions with some scholars advocating for technical skills for IS professionals to be successful in the workplace [6]. Aasheim et al. [20] argue that interpersonal skills rank highly in literature based on the assumption that the foundational technical skills have not changed over time. Tan et al. [16] found that the need for technical skills remains high, whilst business knowledge requirements remain relatively low. Other researchers have seen an almost equal requirement for both technical and business skills and in certain instances where non-technical skills are preferred [9]. Recent technological advances and the shift anticipated from the 4IR require organisations to rethink the roles and responsibilities of IS professionals [17]. BAs must be fluent in both business and technical language while having a good dose of interpersonal skills. This contradicts studies where BAs have been placed in either a purely business or technical role [22].

4 Business Analysis Skills for the 4IR

There are different thoughts about the 4IR. One opinion is that the 4IR is not different from other revolutions but a step-change in the evolution journey the same way that the digital computer impacted the third industrial revolution [20]. Few professions in human history have advanced as rapidly as the IS profession has in the last several decades. Taking into consideration the advancement in technology, Matthee and Turpin [23] recommend the importance of problem-solving and critical thinking as essential 21st-century skills; however, these skills have been a requirement since the inception of the BA career. Another opinion positions the 4IR as a unique revolution due to its nature, with possible impacts on BA skills resulting in a skills mismatch. In the 4IR there is a greater emphasis on integration, interoperability, application architecture and data architecture [20].

The 4IR demands new and faster ways of work including a more technical focused BA as the technological complexity increases. The top three technical skills sought out for the 4IR are Cloud Computing, Big Data, and Security [24]. According to Birgit et al. [25] "technological innovations will be drivers for the transformation of the labour market over the next decade, the innovations will transform industries and business models, change required skills, and shorten the shelf-life of employees' existing skill sets".

Research notes that IS professionals will face challenges in assimilating the ever-increasing amount of new knowledge in the field [21]. BAs must prepare for the challenges that the 4IR will present. Furthermore, the core IS competencies are noted to remain relevant in the 4IR [23]. However, scholars note that there will be a BA skills shortage and business skills gap in the IS workforce [16]. This aligns with researchers such as Birgit et al. [25] who forecast a possible mismatch as the skill sets needed to fulfil future jobs still need to be developed. This notion corresponds with other scholars who have noted the fluidity of the IS field and the need to constantly update skills [26]. Hahm [26] measured the following variables: the attitudes of workers to the 4IR, the importance of skills, intention to use, belief in improvement, efficacy to use, and negative cognition noting these variables play a role in determining how workers will perform in the 4IR era. Table 2 outlines and contrasts identified current and future BA skills.

Mismatch refers to a "misalignment between the composition of labour demand and labour supply" [27]. According to McGuinness [13] a mismatch occurs when there is "overskilling, underskilling, horizontal mismatch, or through the underutilization of skills and the skill gaps". Studies note that in the 4IR novel jobs will require different skills and redeploying to the new ways of work will exacerbate the skill mismatch [28]. It is difficult to predict the type of 4IR skills as the rate of change is not following a straight predictable line, however, there is a sense of agreement in both literature and in practice that the current skills will not be adequate for the era and that the 4IR will cause structural changes and result in a skills mismatch [29].

Table 2. Current and future BA skills. Compiled from literature [30–33]

Skills Category	Current	Future
Technical	▪ Knowledge of Operating systems and applications ▪ Testing Skills ▪ Programming languages ▪ Database ▪ Software development understanding ▪ Business intelligence and reporting software ▪ Data mining ▪ Data visualisation	▪ Business intelligence and reporting software ▪ Data mining ▪ Data visualisation ▪ Cybersecurity ▪ Internet of Things ▪ Artificial Intelligence ▪ Automated Testing
Business	▪ Finance and the economy ▪ Business case development ▪ Domain knowledge ▪ Subject matter expertise ▪ Organisation structures and design ▪ Supplier management ▪ Waste reduction ▪ Experimentation	
Interpersonal	▪ Communication ▪ Relationship building ▪ Influencing ▪ Teamwork ▪ Political awareness ▪ Analytical skills and critical thinking ▪ Attention to detail ▪ Problem solving ▪ Leadership ▪ Self-belief	
Methodology	▪ Waterfall Model ▪ Agile Software Development	▪ Agile Software Development ▪ DevOps ▪ Six Sigma ▪ Lean
Analytical Techniques and Skills	▪ Business Process Modelling Notation ▪ Artifacts/Documentation ▪ UML ▪ Project management	▪ Design Thinking ▪ Lean start-up ▪ Iterative Agile Build ▪ Actual Products/Working software ▪ Understanding the customer ▪ Increasing the value of features to the customer

5 Proposed Business Analysis Skills Mismatch Framework

Figure 1 outlines the proposed framework for this paper derived from the Business Analysis Competency Model. Literature suggests that due to various factors, the 4IR may

induce a skills mismatch between the current and the future 4IR BA skill sets. Variables such as attitude toward the 4IR, education, lifelong learning, and cross-functionality have been proposed to address the mismatch. A quantitative methodology will be used to study the proposed framework. The study will be conducted in the South African context using an online survey to gather the data from Business Analysts. Due to the Covid-19 pandemic and social distancing requirements, convenience sampling may be utilised as a method to target the relevant sample population [34]. Inferential statistics such as non-parametric ranking tests, comparison of means may be performed on the received data responses within and between the 'current' and 'future' skills categories to compare ranking of a particular skill. Within a category, the skills will be ranked in terms of importance from the most important to least important and the overall weighting of each skill will be derived from the rankings. The difference in ranking of skills may reveal a skills mismatch when the ranking of a skill in the current is different to the ranking in the 4IR.

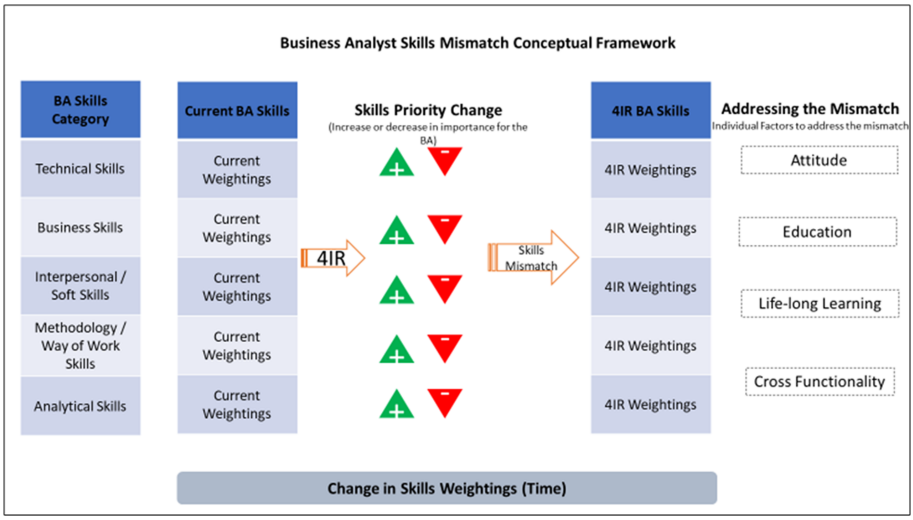

Fig. 1. Skills mismatch framework

5.1 Education

Researchers [19] posit that studies must identify the "skills that BAs indicate as important for their jobs so they can acquire essential training". It is necessary for the BA to get a comprehensive set of skills [35]. In the rapidly changing field of IS, educational programs must be continually re-evaluated and revised to meet the 4IR requirements[20]. Trauth et al. [15] assert that there is an "expectation gap" between industry needs and academic preparation. Industry and academic institution must work together to close this gap by ensuring that academic programmes proactively react to the 4IR trends skills requirements [25].

5.2 Lifelong Learning

The BA must establish a culture of lifelong learning to cope with new demands from the 4IR environment [36]. There is a need for continued learning throughout an IS worker's career by involving themselves in several short courses to keep their knowledge up to date. Several BA courses have expiry dates and/or require regular renewal which gives the BA an opportunity to refresh their skills with updated knowledge and skills. Going forward "IS students and professionals must show a willingness to learn and constantly be learning due to the constant changes in IS" [20].

5.3 Cross Functionality

The BA must break away from the traditional/confined role specific duties and become versatile in their contribution to the business [37] as well as begin to focus on 4IR key specialisations such as cyber security and data analytics. The BA must be agile and adaptable to the new ways of work [38] and with the rate of change of technology prepare themselves for a changing professional landscape. Domain expertise will become increasingly important, and gradually there is a trend of BAs doubling up as a domain expert and as BAs [21]. Researchers are advocating for cross functionality within IS teams to maximise their output which may impact the traditional requirements focused role of the BA [39].

5.4 BA Attitudes

Success in the 4IR will depend largely on how well BAs adapt to these new ways of working, setting up teams, and using group collaboration, Acceptance of change by BAs is crucial for the 4IR to be able to adapt and succeed in a rapidly changing situation. BAs who are more accepting of change have a higher chance of successfully adapting to it and therefore reducing the skills mismatch. People who have these attitudes will be more adaptable and likely to achieve higher performance in the 4IR era [26]. There is a need for a positive attitude and motivation in the IS field.

6 Conclusion

The aim of this paper was to review current and 4IR BA skills by reviewing existing literature. The paper found that there will be a strong bias towards interpersonal and technical BA skills in the 4IR with key focus on cross functionality. The paper proposed a framework for addressing a possible 4IR induced skills mismatch. The identified gap in the literature is limited longitudinal studies tracking the change in importance of BA skills and a lack of understanding of the required skills for the 4IR. There are contradictions in the literature as there were varying opinions on which skills will be relevant for the BA. Hence further research is needed to address this. Further empirical studies will be vital to inform the BA Body of Knowledge and to assist BAs in ensuring that their skills are matched for the 4IR.

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