217 Assessing the Role of Teamwork Skills in Cybersecurity Graduates' Perceived Work Readiness

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Research Domains

Employability, enterprise and graduate careers (EE)

Abstract

The rapid growth of the cyber security field has led to increased demand for cyber security graduates from higher education institutions. However, industry criticism regarding graduates' perceived skill deficits has sparked a debate on the types of skills that higher education should prioritise: 21st century skills or technical cyber skills. To explore this, a survey was conducted with 95 cyber security undergraduates in Australia, investigating the role of teamwork skills – a key component of 21st century skills - in shaping graduates' perceived work competence and social intelligence. Using structural equation modelling, the study identified significant associations between students' perceived teamwork skills, and their work competence, and social intelligence, explaining 48% and 57% of the respective relationships. These findings underscore the necessity of incorporating teamwork skills within cybersecurity curricula across higher education programs, to holistically prepare students for the multifaceted challenges of the modern workforce.

Full paper

Introduction

The 3.4 million global cyber security workforce deficit, growing yearly by 26.2% ((ISC)2, 2023) has spurred universities to expand specialised cyber security programs. Despite this, the industry criticises graduates for lacking work readiness and essential hands-on proficiency required for the profession (Chillas et al., 2015). McGettrick (2013) emphasises that effective cyber security education must incorporate practical components, not solely rely on theory. To handle unpredictable scenarios, students should develop problem-solving, critical thinking, communication, teamwork skills, and technical cyber security expertise.

Work readiness aims to prepare individuals with the essential skills and attributes needed to succeed in a work role requiring minimal supervision or training (Borg & Scott-Young, 2020). The emphasis on skills rather than knowledge has grown in the 21st century (Caballero et al., 2011; Hyslop, 2011). However, there needs to be more research investigating these skills, specifically in cyber security graduates within higher education. This study seeks to explore the significance of teamwork in relation to graduates' work readiness.

Method

A sample of 95 students in Australian universities completed a self-report survey which assessed perceived 21st century skills in cyber security. The survey included reliable scales (see Table 1) for work readiness (Caballero et al., 2011) and teamwork (Lower et al., 2017). Within the work readiness scale there were different factors contributing to work readiness including social intelligence and work competence which are used in this study. A confirmatory factor analysis using the R statistical package ensured that the measurement model was an appropriate fit and then structural equation modelling substantiated the associations. Model fit indices and items used are shown in Table 1.

Table 1

Items for latent constructs by Caballero et al., 2011

Work Readiness - work readiness scale developed by Caballero et al., 2011

Factor 1 – Work competences

1   I have a solid theoretical understanding of my field of work.

2   I set high expectations for myself.

3   I consider myself technically competent to work in the field of cyber security.

Factor 2 – Social intelligence

4   I can express myself easily.

5   I can communicate effectively with others.

6   Developing relationships with people is one of my strengths.

χ^2 (8, N=85) = 8.739, p= 0.365, CFI = 0.994, RMSEA (90% CI) = 0.033 (0.000-0.134), SRMR=0.050

Teamwork scale developed by Lower et al., 2017

1   I feel confident in my ability to work in a team.

2   When working in a team, I value the contributions of my team members.

3   I treat my team members as equal members of the team.

4   I am good at communicating with other team members.

5   I make an effort to include other members of my group.

χ^2 (5, N=95) = 8.129, p= 0.149, CFI = 0.965, RMSEA(90% CI) = 0.081 (0.000-0.178), SRMR=0.044

Results

Confirmatory factor analysis of the measurement indicated a good fit (see Table 1). Factor loadings are shown in Figure 1; all factors loaded at or above .5 except for valuing teamwork at .44. Due to previous scale validation this item was retained (Lower et al., 2017). The recursive structural equation model indicated a good fit with standardised estimates.

As displayed in Figure 1, our study unveiled a strong positive link between students' self-perceived teamwork skills and their work competence, indicated by an unstandardised coefficient of 1.362 (SE=0.318, p<0.000; 95% CI 0.738-1.986). The model explained 48% of the variance in the relationship. Similarly, a significant positive association was found between students' teamwork skills and social intelligence unstandardised coefficient=1.332 (SE=0.333, p<0.000; 95% CI 0.680-1.984), accounting for 57% of the relationship.

Figure 1

Research Model with Associations between Teamwork and Work Readiness
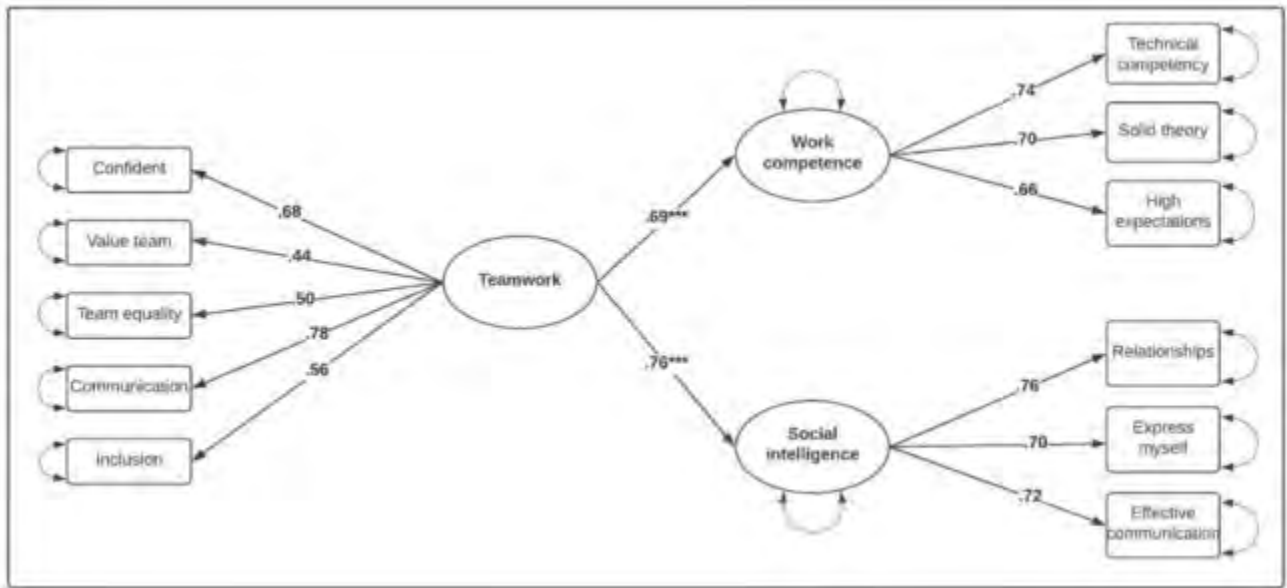
Note: Structural Equation Model with Standardised Estimates for teamwork, work competence and social intelligence. Model fit χ2 (42, N=95) = 45.45, p= 0.330, CFI = 0.998, RMSEA (90% CI) = 0.01 (0.000-0.077), SRMR=0.06.

Discussion

Our findings demonstrate a significant positive association between students' perceived teamwork capabilities and their self-assessed work readiness. This readiness encapsulates competence in technical skills, a robust theoretical foundation, high self-expectations, and the social intelligence required for expressing ideas, communicating effectively, and developing relationships. The data emphasised the importance of feeling competent in teamwork for graduates to consider themselves work ready upon graduation. Notably, teamwork constituted just over half of the relationship with social intelligence, a crucial component of work readiness. This strong connection is understandable considering that effective communication, self-expression, and relationship-building are vital elements within the construct of social intelligence, contributing significantly to successful teamwork.

These findings hold significant implications for evaluating cyber security courses in higher education, particularly in light of industry criticism regarding graduates' perceived lack of skills (Jackson, 2016) and dissatisfaction with university programs (St. Clair & Girard, 2020). The existing literature on the IT sector and skills highlights the importance of focusing on 21st century skills in higher education courses (Chhinzer & Russo, 2018) due to their transferability and high perceived value.

Conclusion

These findings are crucial for developing cyber security curricula. Providing ample opportunities for students to develop teamwork skills enhances their perceived work readiness for the cyber security workforce. Emphasising teamwork in the curriculum prepares students for the industry and improves their career readiness.

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