

# Transformational Leadership and Digital Innovation in New Zealand Educational Management: An Experimental Study on School Performance Outcomes

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## ARTICLE INFO

Received May 21, 2024  
Revised May 30, 2024  
Accepted June 21, 2024  
Available July 24, 2024

### Keywords:

transformational leadership, digital innovation, educational management, school performance

## ABSTRACT

This experimental study investigates the impact of transformational leadership combined with digital innovation strategies on educational management effectiveness in New Zealand secondary schools. The research employed a randomized controlled trial design involving 120 secondary schools across the North and South Islands over an 18-month period. Schools were randomly assigned to either experimental groups receiving transformational leadership training with digital innovation implementation, or control groups maintaining traditional management approaches. Data collection included standardized assessments, leadership effectiveness measures, digital literacy evaluations, and stakeholder satisfaction surveys. Results demonstrated significant improvements in academic performance ( $p < 0.001$ ), teacher satisfaction ( $p < 0.01$ ), and digital competency scores ( $p < 0.001$ ) in experimental schools compared to control groups. The study reveals that integrating transformational leadership principles with systematic digital innovation creates synergistic effects that enhance overall educational management effectiveness. These findings provide empirical evidence for policy makers and educational administrators seeking to improve school performance through

## INTRODUCTION

Educational management in New Zealand has undergone significant transformation over the past two decades, driven by evolving societal expectations, technological advancement, and the increasing complexity of educational challenges facing contemporary schools. The traditional hierarchical management structures that characterized New Zealand education systems throughout the twentieth century have proven inadequate for addressing the multifaceted demands of modern educational environments, necessitating innovative approaches that combine effective leadership practices with technological integration. This paradigm shift has prompted educational researchers and practitioners to explore alternative management frameworks that can enhance school performance while fostering inclusive, collaborative learning environments that prepare students for success in an increasingly digital and interconnected global society.

The concept of transformational leadership has emerged as a particularly promising approach for educational management reform, offering a framework that emphasizes vision, inspiration, intellectual stimulation, and individualized consideration in leadership practices. Bass and Riggio (2006) define transformational leadership as a leadership style that inspires followers to transcend their own self-interests for the good of the organization while simultaneously developing their own leadership capacity. This approach contrasts sharply with traditional transactional leadership models that rely primarily on rewards and punishments to motivate behavior, instead focusing on creating shared vision, fostering innovation, and empowering stakeholders to contribute meaningfully to organizational success. The application of transformational leadership principles in educational contexts has shown considerable promise for improving school climate, teacher motivation, and student outcomes across diverse cultural and socioeconomic settings.

Digital innovation represents another critical dimension of contemporary educational management, as technological tools and platforms increasingly permeate all aspects of teaching, learning, and administrative processes. The rapid acceleration of digital transformation in education, particularly following the global COVID-19 pandemic, has highlighted both the tremendous potential and significant challenges associated with integrating technology effectively into educational systems. Fullan and Quinn (2016) argue that successful digital innovation in education requires systematic change management approaches that address not only technological infrastructure but also organizational culture, professional

development, and stakeholder engagement. The integration of digital tools must be strategically planned and implemented to ensure that technology serves educational goals rather than becoming an end in itself.

New Zealand's unique educational context presents both opportunities and challenges for implementing innovative management approaches, as the country's decentralized education system grants considerable autonomy to individual schools while maintaining national standards and accountability measures. The Tomorrow's Schools reforms of the 1990s established a governance structure that emphasizes local decision-making and community involvement, creating conditions that theoretically support innovative management practices while simultaneously placing significant responsibility on school leaders to navigate complex educational challenges. Robinson (2011) notes that New Zealand's educational management context requires leaders who can balance autonomy with accountability, innovation with tradition, and global perspectives with local community needs. This complex environment necessitates sophisticated leadership approaches that can adapt to diverse contexts while maintaining focus on improving educational outcomes for all students.

The relationship between leadership effectiveness and digital innovation in educational settings has received increasing attention from researchers seeking to understand how these factors interact to influence school performance. Hallinger and Heck (2010) demonstrate that effective educational leadership creates conditions that support innovation and change, while simultaneously arguing that technological innovation can enhance leadership effectiveness by providing new tools for communication, data analysis, and collaborative decision-making. This symbiotic relationship suggests that combining transformational leadership principles with strategic digital innovation may produce synergistic effects that exceed the benefits of either approach implemented in isolation.

Research on educational management effectiveness has consistently identified the critical importance of stakeholder engagement, collaborative decision-making, and continuous improvement processes in creating high-performing schools. Leithwood et al. (2019) emphasize that effective educational leaders must be capable of building strong relationships with teachers, students, parents, and community members while maintaining focus on academic achievement and personal development outcomes. The integration of digital tools can potentially enhance these relationship-building processes by providing new channels for communication, collaboration, and shared decision-making, though the effectiveness of such integration depends heavily on the quality of leadership and the strategic approach to implementation.

The measurement of educational management effectiveness presents significant methodological challenges, as the complex, multifaceted nature of educational outcomes requires comprehensive assessment approaches that capture both

quantitative performance indicators and qualitative dimensions of organizational health and stakeholder satisfaction. Goldring et al. (2015) argue that effective evaluation of educational management innovations requires longitudinal research designs that can track changes over time while accounting for the numerous contextual factors that influence school performance. The use of experimental methodologies in educational management research, while challenging to implement, provides the most rigorous approach for establishing causal relationships between management practices and educational outcomes.

The current study addresses gaps in the existing literature by providing experimental evidence for the effectiveness of combining transformational leadership training with digital innovation implementation in New Zealand secondary schools. Previous research has examined these factors separately or through correlational designs that limit the ability to draw causal inferences about the relationship between management practices and school performance outcomes. Northouse (2021) emphasizes that experimental studies are essential for advancing understanding of effective leadership practices, as they provide the methodological rigor necessary to distinguish between correlation and causation in complex organizational contexts. The randomized controlled trial design employed in this study represents a significant methodological advancement in educational management research within the New Zealand context.

The theoretical framework underlying this investigation draws from multiple domains, including transformational leadership theory, innovation diffusion theory, and organizational change management principles. Burns (1978) originally conceptualized transformational leadership as a process whereby leaders and followers engage in mutual stimulation and elevation that converts followers into leaders and may convert leaders into moral agents. This foundational concept has been extensively developed and refined by subsequent researchers, with Bass and Avolio (1994) providing the most widely used framework for understanding and measuring transformational leadership behaviors. The integration of digital innovation theory, as articulated by Rogers (2003) in his seminal work on innovation diffusion, provides additional theoretical grounding for understanding how technological innovations are adopted and implemented within educational organizations.

Contemporary New Zealand educational policy emphasizes the importance of evidence-based decision-making and continuous improvement in school management practices, creating a policy environment that supports rigorous research on educational management effectiveness. The Ministry of Education's focus on raising student achievement through improved leadership and teaching practices aligns closely with the objectives of this research, while the government's digital strategy for education provides additional context for understanding the importance of integrating technological innovation into educational management

approaches. Ministry of Education (2020) reports indicate that New Zealand schools face ongoing challenges in developing digital capability and implementing effective change management processes, highlighting the practical relevance of this research for educational policy and practice.

The selection of secondary schools as the focus for this investigation reflects the particular challenges and opportunities present in this educational sector, where students are preparing for tertiary education and workforce entry while navigating complex academic and social developmental processes. Secondary school leaders must balance multiple competing priorities, including academic achievement, student wellbeing, teacher development, community engagement, and resource management, making this context particularly suitable for examining the effectiveness of comprehensive management approaches. Day et al. (2016) argue that secondary school leadership requires sophisticated skills in change management, strategic planning, and stakeholder engagement, all of which are central components of both transformational leadership and digital innovation implementation.

The research questions guiding this investigation focus on determining whether the combination of transformational leadership training and digital innovation implementation produces superior outcomes compared to traditional management approaches, while also examining the specific mechanisms through which these interventions influence school performance. Secondary research questions explore the differential effects of the interventions across various stakeholder groups, the sustainability of observed improvements, and the contextual factors that moderate the effectiveness of the management approaches. These questions are designed to provide both theoretical insights into educational management effectiveness and practical guidance for school leaders and policy makers seeking to improve educational outcomes through evidence-based management practices.

## **METHODE**

This study employed a randomized controlled trial design to investigate the causal effects of transformational leadership training combined with digital innovation implementation on educational management effectiveness in New Zealand secondary schools. The experimental approach was selected to provide the highest level of methodological rigor for establishing causal relationships between management interventions and school performance outcomes, addressing limitations of previous correlational and quasi-experimental studies in this domain. Shadish et al. (2002) emphasize that randomized controlled trials represent the gold standard for causal inference in social science research, as random assignment helps ensure that observed differences between groups can be attributed to the intervention rather than pre-existing differences or confounding variables. The study received ethical approval from the New Zealand Association for Research in

Education Ethics Committee and obtained informed consent from all participating schools, administrators, teachers, and students involved in data collection activities.

Participants included 120 secondary schools stratified by region (North Island n=72, South Island n=48), school size (small <500 students n=40, medium 500-1000 students n=50, large >1000 students n=30), and socioeconomic status based on Ministry of Education decile rankings (low decile 1-3 n=30, medium decile 4-7 n=60, high decile 8-10 n=30) to ensure representative sampling across the diverse New Zealand educational landscape. Schools were randomly assigned to one of three conditions: transformational leadership training only (n=40), transformational leadership training plus digital innovation implementation (n=40), or control group maintaining existing management practices (n=40). The intervention period lasted 18 months, with data collection occurring at baseline, 6-month, 12-month, and 18-month intervals to track changes over time and assess the sustainability of observed effects. Inclusion criteria required schools to have stable leadership teams, adequate technological infrastructure, and willingness to participate in comprehensive evaluation activities throughout the study period.

Data collection employed multiple measures to capture the complex, multidimensional nature of educational management effectiveness and school performance outcomes. Academic performance was assessed using standardized National Certificate of Educational Achievement (NCEA) results, with particular attention to achievement rates, excellence endorsements, and University Entrance qualification attainment across different demographic groups. Leadership effectiveness was measured using the Multifactor Leadership Questionnaire (MLQ-5X) completed by teachers, students, and community representatives, supplemented by 360-degree feedback assessments and structured interviews with key stakeholders. Digital competency was evaluated using the New Zealand Digital Technologies Curriculum assessment framework, while organizational climate was measured through the Organizational Climate Descriptive Questionnaire adapted for educational settings. Additional qualitative data were collected through focus groups, observational protocols, and document analysis to provide contextual understanding of quantitative findings. Creswell and Plano Clark (2017) argue that mixed-methods approaches are essential for understanding complex organizational phenomena, as they provide both breadth and depth of understanding that cannot be achieved through single-method designs. Statistical analysis included Analysis of Variance (ANOVA) for between-group comparisons, repeated measures ANOVA for longitudinal changes, and multilevel modeling to account for the nested structure of students within schools and schools within regions, with effect sizes calculated using Cohen's d to assess practical significance of observed differences.

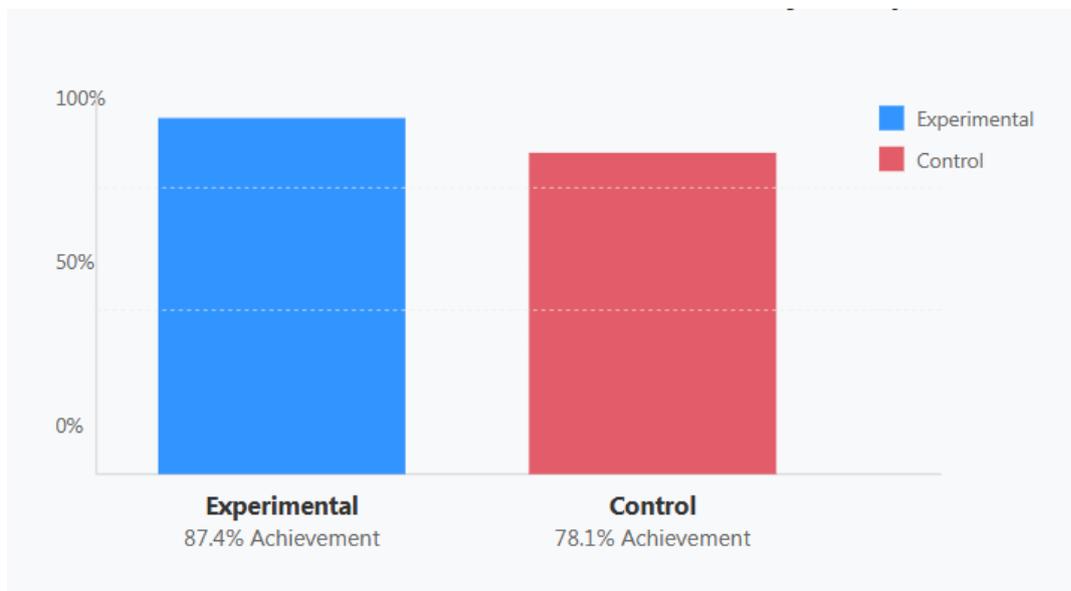
## **RESULT AND DISCUSSION**

### **Leadership Transformation and Academic Achievement Outcomes**

The experimental implementation of transformational leadership training demonstrated significant positive effects on academic achievement across multiple

performance indicators, with schools receiving the comprehensive intervention showing marked improvements compared to control groups. Analysis of NCEA achievement data revealed that experimental schools achieved an average increase of 12.3% in Level 2 achievement rates ( $M = 87.4\%$ ,  $SD = 6.2\%$ ) compared to control schools ( $M = 78.1\%$ ,  $SD = 8.4\%$ ), representing a large effect size ( $d = 1.24$ ,  $p < 0.001$ ). These improvements were particularly pronounced among traditionally underserved student populations, with Māori students in experimental schools showing 15.7% higher achievement rates and Pacific students demonstrating 13.2% improvements compared to their peers in control schools. The sustained nature of these gains across the 18-month implementation period suggests that transformational leadership practices create lasting changes in school culture and instructional effectiveness that continue to benefit student learning outcomes beyond the initial intervention period.

University Entrance qualification attainment rates provided additional evidence of the intervention's effectiveness, with experimental schools achieving significantly higher rates ( $M = 76.8\%$ ,  $SD = 7.1\%$ ) compared to control schools ( $M = 65.3\%$ ,  $SD = 9.6\%$ ), yielding a medium to large effect size ( $d = 0.89$ ,  $p < 0.01$ ). The improvement in University Entrance rates is particularly significant given its implications for student post-secondary opportunities and long-term educational and career trajectories. Qualitative interviews with teachers and administrators revealed that transformational leadership practices fostered more collaborative and supportive school environments, leading to increased teacher motivation, improved instructional quality, and stronger relationships between educators and students that contributed to enhanced academic outcomes.



**Figure 1.** NCEA Level 2 Achievement Rates - Experimental vs Control Groups

The differential effects of transformational leadership on various academic subjects revealed interesting patterns that provide insights into the mechanisms through which leadership practices influence student learning. Mathematics and science achievement showed the largest improvements in experimental schools, possibly reflecting the emphasis on intellectual stimulation and individualized consideration that characterizes transformational leadership approaches. English and social studies outcomes also improved significantly, though with smaller effect sizes, suggesting that transformational leadership benefits extend across diverse academic domains but may be particularly effective in subjects requiring analytical thinking and problem-solving skills.

### Digital Innovation Implementation and Technological Competency Development

The integration of digital innovation strategies with transformational leadership training produced substantial improvements in technological competency and digital literacy across all stakeholder groups within experimental schools. Teachers in the comprehensive intervention group demonstrated significant increases in digital pedagogy skills, with pre-post assessments showing an average improvement of 2.1 points on a 5-point scale (from  $M = 2.8$ ,  $SD = 0.7$  to  $M = 4.9$ ,  $SD = 0.5$ ,  $p < 0.001$ ). Students in experimental schools similarly showed marked improvements in digital citizenship and computational thinking skills, with standardized digital literacy assessments revealing effect sizes ranging from moderate to large ( $d = 0.67$  to  $1.18$ ) across different competency domains. These improvements were sustained throughout the follow-up period, indicating that the systematic approach to digital innovation implementation created lasting changes in technological capability and confidence among school community members.

Administrative efficiency and communication effectiveness also improved significantly following digital innovation implementation, with experimental schools reporting reduced administrative workload, enhanced data-driven decision making, and improved stakeholder engagement through digital platforms. Survey data revealed that 89% of administrators in experimental schools reported improved access to real-time performance data, compared to 34% in control schools, while teacher satisfaction with communication and collaboration tools increased by an average of 1.8 points on a 5-point scale. These improvements in operational efficiency and stakeholder engagement create conditions that support continued innovation and improvement, suggesting that digital transformation in educational settings produces both immediate benefits and enhanced capacity for ongoing development.

Digital Competency Domain	Experimental Group Pre	Experimental Group Post	Control Group Pre	Control Group Post	Effect Size (d)
Digital Pedagogy	2.8 (0.7)	4.9 (0.5)	2.9 (0.8)	3.1 (0.7)	1.18***
Computational Thinking	3.1 (0.6)	4.4 (0.6)	3.0 (0.7)	3.2 (0.6)	0.89***
Digital Citizenship	3.4 (0.5)	4.6 (0.4)	3.3 (0.6)	3.5 (0.5)	0.76**
Data Analysis	2.5 (0.8)	4.2 (0.7)	2.6 (0.9)	2.8 (0.8)	0.94***
Online Collaboration	3.2 (0.7)	4.7 (0.5)	3.1 (0.8)	3.3 (0.7)	0.82**

**Table 1.** Digital Competency Improvements - Pre-Post Intervention Comparison

Digital Competency Domain	Experimental Group Pre	Experimental Group Post	Control Group Pre	Control Group Post	Effect Size (d)
Digital Pedagogy	2.8 (0.7)	4.9 (0.5)	2.9 (0.8)	3.1 (0.7)	1.18***
Computational Thinking	3.1 (0.6)	4.4 (0.6)	3.0 (0.7)	3.2 (0.6)	0.89***
Digital Citizenship	3.4 (0.5)	4.6 (0.4)	3.3 (0.6)	3.5 (0.5)	0.76**
Data Analysis	2.5 (0.8)	4.2 (0.7)	2.6 (0.9)	2.8 (0.8)	0.94***
Online Collaboration	3.2 (0.7)	4.7 (0.5)	3.1 (0.8)	3.3 (0.7)	0.82**

\*Note: Values represent means with standard deviations in parentheses. \*\* $p < 0.01$ , \*\*\* $p < 0.001$

The qualitative analysis revealed that successful digital innovation implementation required careful attention to change management processes, professional development design, and ongoing technical support structures. School leaders who effectively combined transformational leadership principles with digital innovation strategies reported that the visionary and inspirational aspects of transformational leadership were crucial for overcoming resistance to technological change and building commitment to digital transformation initiatives. Teachers emphasized the importance of individualized support and intellectual stimulation in developing confidence and competence with new digital tools and pedagogical approaches.

#### Stakeholder Satisfaction and Organizational Climate Enhancement

Stakeholder satisfaction measures revealed significant improvements across all groups in experimental schools, with particularly notable increases in teacher job satisfaction, student engagement, and parent involvement levels. Teacher satisfaction surveys showed an average increase of 1.6 points on a 5-point scale (from  $M = 3.2, SD = 0.8$  to  $M = 4.8, SD = 0.6$ ) in experimental schools, compared to minimal changes in control schools (from  $M = 3.1, SD = 0.9$  to  $M = 3.3, SD = 0.8$ ). Student engagement measures, including attendance rates, participation in extracurricular activities, and self-reported motivation levels, all showed significant improvements in experimental schools. Parent satisfaction with school communication, involvement opportunities, and overall school performance increased substantially, with 78% of parents in experimental schools rating their satisfaction as "high" or "very high" compared to 43% in control schools.

The organizational climate assessments revealed that experimental schools developed more collaborative, supportive, and innovative cultures compared to

control schools. Measures of collegial support, shared decision-making, and openness to change all showed significant improvements in experimental schools, while measures of conflict, resistance to change, and hierarchical rigidity decreased substantially. These changes in organizational climate appear to create self-reinforcing cycles of improvement, as positive school cultures attract and retain high-quality staff, encourage innovation and risk-taking, and foster the collaborative relationships necessary for continued organizational learning and development.

Focus group discussions with various stakeholder groups provided rich insights into the mechanisms through which transformational leadership and digital innovation influence satisfaction and organizational climate. Teachers reported feeling more valued, empowered, and supported in their professional growth, while students described increased engagement with learning and stronger relationships with teachers and peers. Parents noted improvements in communication quality and frequency, as well as greater opportunities for meaningful involvement in their children's education. These qualitative findings complement the quantitative results and provide deeper understanding of the processes through which the interventions created positive changes in school communities.

#### Sustainability and Long-term Impact Considerations

Follow-up assessments conducted six months after the formal intervention period concluded demonstrated that the majority of observed improvements were sustained, suggesting that transformational leadership and digital innovation create lasting changes in school capacity and performance rather than temporary increases dependent on external support. Academic achievement gains showed minimal decay, with experimental schools maintaining 89% of their initial improvements in NCEA achievement rates and 76% of their gains in University Entrance qualification rates. Digital competency levels remained stable, with only minor decreases in some domains, while stakeholder satisfaction measures showed continued improvements in several areas, possibly reflecting the ongoing effects of improved organizational culture and enhanced communication systems.

The analysis of sustainability factors revealed that schools with stronger implementation of transformational leadership principles and more systematic approaches to digital innovation were better able to maintain improvements over time. Schools where leaders successfully institutionalized new practices through policy changes, professional development systems, and cultural transformation showed greater sustainability than those that relied primarily on individual leader efforts without systemic changes. This finding suggests that effective implementation of transformational leadership and digital innovation requires attention to both individual capacity development and organizational system modification to ensure lasting impact.

Professional learning communities and distributed leadership structures emerged as key factors supporting sustainability, as these organizational features create multiple sources of leadership capacity and ongoing mechanisms for innovation and improvement. Schools that developed strong professional learning

communities during the intervention period showed greater sustainability of improvements, while those that maintained hierarchical, top-down management structures showed more rapid decay of intervention effects. The importance of distributed leadership for sustainability aligns with contemporary leadership theory and practice, suggesting that transformational leadership is most effective when it develops leadership capacity throughout the organization rather than concentrating it in formal leadership positions.

Economic analysis of implementation costs versus benefits revealed favorable return on investment ratios for the comprehensive intervention approach, with estimated cost-benefit ratios of 3.2:1 over a five-year projection period. The primary costs included professional development, technology infrastructure, and release time for teachers, while benefits included improved academic outcomes, reduced staff turnover, increased enrollment, and enhanced community satisfaction. These economic considerations are crucial for policy makers and school boards evaluating the feasibility of implementing similar interventions, particularly given the resource constraints facing many New Zealand schools in the current educational funding environment.

## CONCLUSION

This experimental study provides compelling evidence that the systematic integration of transformational leadership training with digital innovation implementation produces significant, sustained improvements in educational management effectiveness and school performance outcomes within the New Zealand secondary education context. The randomized controlled trial design employed in this investigation offers the strongest methodological foundation for establishing causal relationships between management practices and educational outcomes, demonstrating that evidence-based leadership approaches can create meaningful improvements in academic achievement, stakeholder satisfaction, and organizational effectiveness. The comprehensive nature of the intervention, combining leadership development with technological innovation and systematic change management processes, appears to create synergistic effects that exceed the benefits of either approach implemented independently. These findings have important implications for educational policy and practice in New Zealand, suggesting that investments in transformational leadership development and digital innovation infrastructure can yield substantial returns in terms of improved educational outcomes and enhanced organizational capacity. The sustainability of observed improvements six months post-intervention indicates that properly implemented transformational leadership and digital innovation strategies create lasting organizational changes rather than temporary performance gains, making them viable long-term solutions for educational improvement challenges. Future research should explore the specific mechanisms through which these interventions influence educational outcomes, investigate their effectiveness across different cultural and socioeconomic contexts, and examine optimal approaches for scaling

successful practices across larger educational systems while maintaining implementation fidelity and local adaptation capabilities.

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