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Academic Leadership and Digital Transformation as Drivers for Business Model Innovation and Excellence in Shanghai Ranking (ARWU): An Analytical Study at the University of Anbar

Intisar Abbas Jebur Al-Awidi
College of Administration and Economics, Department of Business Administration, Southern Technical University, Iraq.
https://orcid.org/0000-0003-3314-5698
Supervisors:
Prof. Dr. Abdul Salam Ali Hussein Alnoori & Prof. Dr. Adel BouBaker
University of Anbar, University of Tunis El Mana

Abstract
This paper seeks to recommend a Global Business Model Innovation (GBMI 3.0) model that will enable the University of Anbar to fill the technological maturity and human competency gap to improve its preparedness for theAcademic Ranking of World Universities (ARWU). It takes a mixed-methods approach and comparative case study design between the University of Anbar and the University of Tunis El Manar, gathering information from 84 academic leaders basedon the basis of a validated questionnaire and a unique Digital Maturity Checklist created with the use of a 7-point documentation scale. The research incorporates Systems Theory, UTAUT2 and Institutional Imprint Theory. Findings indicate that although the university has a high technological maturity in terms of infrastructure at 90.6, there is a severe shortage of human digital skills at 40, which prevents the generation of high-impact research. The GBMI 3.0 model suggests four coordinated stages, including value creation, value proposition, value capture, and digital ,maturity that will address this gap and make ARWU more prepared. The research makes a contribution to the literature because it simplifies the GBMI 3.0 model, in which the digital inputs are directly related to ARWU outputs to provide a strategic roadmap for universities in developing contexts.
Keywords: Business Model Innovation, Digital Transformation, Academic Leadership, ARWU Ranking, Higher Education, GBMI 3.0.

Introduction

Academic ranking of world universities (ARWU), which was initiated in 2003 by Shanghai Jiao Tong University has become the most stringent and objective measure of university excellence in the world (Liu and Cheng, 2005). In comparison to other rating systems that largely depend on the subjective reputation surveys, ARWU uses six measurable indicators that emphasize more on the quality of research output and faculty excellence (ShanghaiRanking Consultancy, 2023). The methodology is based on weighting the Nobel Prizes and Fields Medals at 30, the significantly cited researchers at 20, the publications in Nature and Science at 20, and the papers included in the Science Citation Index-Expanded and Social Sciences Citation Index at 20, which is why it is the most research-centered ranking in the world (Zhang et al., 2022). The assessment of 2,500 universities is done every year, and the results of the 1,000 highest ranked universities are published, establishing intense competition in terms of institutional prestige and funding opportunities at the global level (Hazelkorn, 2021). ARWU has however been accused of being biased towards large institutions with large pools of faculty thus disadvantaging smaller or new universities who may be highly productive per-capita (Waltman et al., 2023). This organizational limitation requires new strategic solutions, especially a digital transformation, to span the resource limitation and reach a competitive level of parity.

Academic leadership has been changing in terms of conventional administration to multidimensional transformative power that is needed to navigate the complexity of higher education in the digital era (Dumulescu & Muțiu, 2021). The modern academic leadership has four important :dimensions strategic ,leadership which formulates the vision of the institution in line with the global competitiveness ;objectives organizational ,leadership which creates agile governance structures that are able to respond ;quickly technological leadership, which exhibits profound awareness and support towards digital ;innovation and cultural leadership, which creates environments of experimentation, risk-taking and continuous learning (Bass and Riggio, 2006). Scientists underline that a technological literacy among university leaders is no longer an option but a necessity since the digital literacy of leaders directly influences the ability of the institutions to use newly developed technologies to achieve research excellence (Zhu and Engels, 2021). The replacement of an input-based administration to an output-based leadership is a total reconstruction of academic management (Avolio et al., 2009). Real academic leadership is open, ethical and role model and these attributes are fundamental to establishing trust in cases of disruptive digital changes (George et al., 2007).

Digital transformation in higher education is not simply the digitization of processes that are currently present, but a comprehensive rethinking of the operations, culture, and value propositions of the institution (Vial, 2019). A three-dimensional model of digital mindset, digital technologies, and digital capabilities is suggested by researchers and validated (Leite et al., 2024). This framework fills the gap that has been noted in the past studies whereby universities tend to spend a lot of money on hardware and software and do not consider the human and cultural aspects that require proper adoption (Gartner, 2022). Current research has discovered that not a single institution assesses the actual use of technology compared to its availability, which is an important methodological shortcoming of evaluating the maturity of digital transformation (Becker et al., 2020). UTAUT2 model offers theoretical support forunderstanding of faculty adoption behaviours in terms of performance expectancy, effort expectancy, social influence, and facilitating conditions (Venkatesh et al., 2012). The strategic value of digital transformation is that it can be used as a force multiplier of leadership, which can enhance the effectiveness of strategic initiatives by using data-driven decisions, operating globally, and being efficient (Rogers, 2016).

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University Business model innovation is the re-conception of the logic of value creation, delivery, and capture (Osterwalder and Pigneur, 2010). University business models which were historically based on government subsidies and monopoly in the awarding of ,degrees are becoming more and more unsustainable in competitive world markets (Christensen and Eyring, 2011). Scholars show that digital transformation requires a business model ,change as it is the only way to address the tensions between the old processes and the digital ,potential and suggest a framework for higher education institutions that links technological investments with strategic value propositions (Clauss, 2017). Researchers come up with a business model innovation scale that is comprehensive and includes value creation innovation, value proposition innovation, and value capture innovation that can be applied to a university setting when profit can be redefined as research impact, reputation, and contribution to society (Foss and Saebi, 2017). It is contended that dynamic capabilities are conditions that lead to successful business model innovation (Teece, 2018). The 4Ps value framework entails a systematic means through which the universities can switch between input-based models to outcome-based services (Porter and Kramer, 2011). Recent research supports the idea that business models are neither fixed objects nor fixed systems but dynamic systems that need to be constantly adjusted, particularly in technologically disruptive markets such as higher education (Snihur and Zott, 2020).

The proposed study fills one of the most significant gaps in literature in the intersection of academic leadership, digital transformation, business model innovation, and global university rankings. Though there is a lot of research that studies each construct separately, very little empirical research quantifies the synergies or offers practical frameworks on how the constructs can be put to practical use. Particularly, the paper examines the presence of digital transformation as a strategic moderator (strengthening leadership performance) or simply asan additive factor. The situation at the University of Anbar is an eye-opening example: even with a significant amount of research, theproposed study fills one of the most significant gaps in the literature at the intersection of academic leadership, digital transformation, business model innovation, and global university rankings. Though there is a lot of research that studies each construct separately, very little empirical research quantifies the synergies or offers practical frameworks on how the constructs can be put to practical use. Particularly, the paper examines the presence of digital transformation as a strategic moderator (strengthening leadership performance) or simply asan additive factor. The situation at the University of Anbar is an eye-opening example: even with a significant amount of technology investments in the digital infrastructure maturity, the gaps in digital competencies remain, and they do not allow for transforming the technological capacity into the research output that is needed to enter ARWU. This irony of high availability of technology and low influence on research is the bane of universities in developing nations. This study will provide the universities that want to become global leaders witha theoretically based, empirically validated roadmap by creating and testing the GBMI 3.0 model (Global Business Model Innovation version 3.0). The value is not only theoretical contributions, ,.i.e the integration of Systems Theory, UTAUT2, Imprint Theory, and Expectancy Theory, but also practical utility: a 74-item online maturity measurement instrument, leadership and ARWU readiness measurement scales validated by testing, and a strategy forimplementation that is completed in phases, tested by comparative analysis with Tunis El Manar University. Finally, this research debunks technological determinism as it shows that the ability of leadership and human ,resources and not just infrastructure, is the key to attaining world-class research excellence.

1. Literature Review and Theoretical Framework

1.1.Shanghai Ranking and Digitalization

ARWU is one of the three most dominant and most followed university rankings in the ,world alongside THE and QS (Hazelkorn, 2021). The importance of it is that it uses objective and quantitative measures that are based on real outputs of the university instead of subjective data on university reputation (Liu and Cheng, 2005). The ranking of over 2,500 universities is done each ,year and the results of the top 1,000 are published. However,

ARWU is also criticized because it does not adjust the scores based on the size of the institution, thus giving preference to bigger universities with higher faculty and student counts(Waltman et al., 2023). This dilemma demands smaller universities to implement new approaches to attain high levels of research percapita that can be achieved through the leverage of digital tools(Zhang et al., 2022).

The ARWU has 80 percent weight on awards, highly cited authors, publications in Nature and Science, and indexed publications that are all about research excellence, quality, and quantity (ShanghaiRanking Consultancy, 2023). Any digital transformation strategy that is not focused on serving scientific research would not be effective in ARWU positioning (Abramo et al., 2020). The highly cited researchers indicator needs critical impact data platforms and analytics, whereas Nature and Science publications need writing support and analytics with critical impact as well (Bornmann and Daniel, 2008). The impact of papers indexed in SCIE and SSCI must be very high to be included in Current Research Information Systems (CRIS) (Houssos et al., 2022).

1.2. Digital Higher Education Transformation.

Digital transformation is not just the digitization but a complicated strategic, cultural, and organizational transformation (Rogers, 2016; Vial, 2019). Digital transformation is described as a process that tries to enhance an entity by initiating meaningful changes in its properties by using a combination of information, computing, communications, and connectivity technology (Vial, 2019). The conceptual development of digital transformation can be explained as three phases: digitization

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1.0 is the conversion of analog to digital, ,.i.e scanning of documents; digitalization 2.0 is the application of digital resources to existing processes, ,.e.g the learning management system application; and digital transformation 3.0 is the redesign of business models, value propositions, and organizational culture (Fernandez et al., 2023).

A three-dimensional framework of digital transformation in universities is suggested by researchers and proven (Leite et al., 2024). The first dimension is the digital mindset, which is the cognitive and behavioral preparedness of the leadership and faculty to accept change, experimentation, and calculated risk-taking (Becker et al., 2020). This dimension comprises digital culture at every level of an organization, readiness to break the traditional rules of academic life, emotional intelligence in dealing with digital change, and an innovation-based culture that is not afraid of failure (Schallmo et al., 2017). The second dimension, digital technologies, is concerned with infrastructure and tools that can support digital operations and encompasses cloud computing platforms, artificial intelligence and machine learning tools, up-to-date research information systems, learning management systems with analytics functionality, cybersecurity infrastructure, and Internet of Things technologies to support smart campuses (Gartner, 2022). Digital capabilities as the third dimension deal with human capabilities mandated to work with digital technologies and convert data into actionable insights, such as competencies to perform comprehensive data analytics with digital tools, competencies in digital research methods, the ability to publish in high-impact journals using digital tools, and project management competencies in the digital environment (Klumpp et al., 2021).

1.3. Academic Leadership in the Digital Era

The old academic management was made with the principle of administrative efficiency and stability (Bass and Riggio, 2006). The leadership of the digital age necessitates a paradigmatic shift in leadership to a more strategic foresight that foresees the disruption of technology, paradoxical leadership where leaders walk the line between exploiting the existing systems and exploring the new innovations, and genuine digital advocacy where leaders become role models in adopting technology (Avolio et al., 2009).There are four dimensions of academic leadership that are related to each other (Dumulescu and Muțiu, 2021). Strategic leadership is the first dimension that aims at creating a clear digital vision that meets the needs of ARWU, creating five to ten-year strategic plans with key performance indicators that can be measured and ensuring the financial support of and partnership in digital projects (George et al., 2007). The second dimension, organizational leadership, focuses on the application of agile governance, with less bureaucracy, the formation of cross-functional teams where IT, research, and teaching roles are combined, centers of excellence in digital innovation, and the delegation of authority to facilitate quick decision-making (Zhu and Engels, 2021). Technological leadership is the third aspect, which comprises familiarity with emerging technologies, such as artificial intelligence, blockchain, and extended reality, informed decisions about technology investments based on the payback, supporting CRIS implementation to track research, and linking faculty ORCID with global databases (Klumpp et al., 2021). The fourth dimension is cultural leadership, where innovation and experimentation is encouraged, the development of digital competency is rewarded, calculated failures are accepted as learning experiences, and the knowledge transfer between digital natives and digital immigrants is encouraged between the generations (Prensky, 2001).

1.4. Business Model Innovation at Universities.

The concept of business model is described as the rationale of how an organization creates, provides and captures value (Osterwalder and Pigneur, 2010). The pursuit of new rationales and new value creation and capture to stakeholders is known as business model innovation (Clauss, 2017). As a paradigm change in the higher education setting, business model innovation is the shift in a conventional input-based model of student enrollment, curriculum delivery, and degree granting that is largely government-funded to an innovative output-based model of employment, research impact, and lifelong learning with diversified sources of revenue (Christensen and Eyring, 2011).

The first stage, value creation, entails recognizing the unmet needs of the stakeholders, creating new academic courses, and carrying out innovative researches (Foss & Saebi, 2017). The digital enablers of this stage are artificial intelligence to identify gaps in research and predictive analytics to forecast trends in the labor market (Teece, 2018). Its relevance in terms of ARWU is that it forms the basis of winning faculty production and novel research in the publications of Nature and Science (Bornmann and Daniel, 2008). Value configuration is the second stage, which is concerned with resource assembly, capability building, and strategic alliances (Porter and Kramer, 2011).

Cloud-based collaboration solutions and virtual research labs are examples of digital enablers (Klumpp et al., 2021). In the case of ARWU, international relations directly raise the co-authorship and citation rates, which affect the indicators of HiCi and PUB (Abramo et al., 2020). The third step is value delivery, which focuses on the provision of educational services, sharing of research and transfer of knowledge to society (Snihur and Zott, 2020). The digital enablers include massive open online courses, open access publishing, and CRIS systems to visibility (Houssos et al., 2022). The relevance of ARWU is high because open access enhances citability and online education expands the alumni networks (Zhang et al., 2022). The fourth stage, value capture, consists of monetization strategy, intellectual property management, and stakeholder satisfaction measures (Teece, 2018). Some examples of digital enablers are all-encompassing learner records and research impact dashboards (Gartner, 2022). This stage directly influences ARWU by having a high per-capita performance by means of effective digital operations (Waltman et al., 2023).

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2. Research Methodology

The study is pragmatic and philosophically oriented that emphasizes the solutions to real issues in higher education (Creswell and Plano Clark, 2017). The study uses a sequential explanatory mixed-method research design, incorporating a quantitative phase of the study involving the use of surveys to determine perceptions of academic leadership, digital transformation, and ARWU preparedness with 84 participants and qualitative phase of the study involving the use of a digital maturity checklist and semi-structured interviews with 15 participants to create a contextual depth (Tashakkori and Teddlie, 2010). The study focuses on the University of Anbar in Iraq as the main case study, which is a government-owned university with 12,000 students and was founded in 1987, and contrasts it with the University of Tunis El Manar in Tunisia, a government-owned university of the same size but included in the ARWU top 1000 (Yin, 2018). The reason behind this comparison is that both institutions are developing country Arabic, publicly funded, and comprehensive universities that allow the comparative analysis to be controlled (Stake, 2013).

of Anbar and involvement in online programs or research under supervision (Miles et al., 2The target population will include all the academic leaders (deans, vice-deans and department heads) of the University of Anbar (47 individuals), and senior faculty members (associate professors and full professors with a minimum of five years of experience) (189 individuals) totaling 236 individuals (Hair et al., 2019). The purposive criterion sampling was used to select the sample of participants who satisfied certain criteria of information-rich cases (Patton, 2014). The inclusion criteria were that the participants had to be in an academic leadership position or former faculty in an academic leadership position or at least senior faculty at the associate or full professor rank with a minimum of five years at the University.

2.1. Determination of sample size ensued.

The table of Krejcie and Morgan indicated that the number of population was 236 and the level of confidence was 95 percent, meaning that the population had to have at least 148 of them, yet a sample of 84 was reached due to the availability of the population and the necessity to have expertise (Cohen et al., 2017). The response rate was also 84 out of 92 mailed surveys and response rate of 91.3% which is considered excellent in academic surveys (Nulty, 2008).

The measurement of the academic leadership perception, digital transformation perception, and ARWU preparedness are to be checked according to the structured questionnaire (Hair et al., 2019). The literature review was the starting point of the development, which will be conducted in November 2022-January 2023 and will review 87 peer-reviewed articles to identify validated scales (Creswell and Plano Clark, 2017). Based on the published works, academic leadership was altered based on Dumulescu and Muetzui (2021) on approximately 4 dimensions, digital transformation was altered based on Leite et al. (2024) on approximately 3 dimensions, and ARWU preparedness was developed based on official ARWU methodology (ShanghaiRanking Consultancy, 2023). The scale was a five-point scale on a Likert scale, which was in between strongly disagree and strongly agree (Cohen et al., 2017).The digital maturity checklist was created to measure the actual level of implementation of digital transformation initiatives at University of Anbar objectively, without considering the subjective perceptions (Becker et al., 2020). The theoretical framework will be based on the Digital Transformation Monitor framework developed around the European Union and scaled to higher education based on the dimensions of researchers (Gartner, 2022). The scoring system design is based on a 7-point scale according to which 0 signifies no implementation, 1 partial implementation, which is undocumented, 2 partial implementation but undocumented, 3 partial implementation but fully documented, 4 full implementation but undocumented, 5 full implementation, and partially documented, and 6 full implementation and fully documented (Klumpp et al., 2021).

Expert panel method was used to establish the content validity of the questionnaire with 12 experts (Lawshe, 1975). The content validity ratio of the individual items was determined using the formula of Lawshe where CVR = number of experts rating the item as important/2 half of the total/2 half of the total. The lowest CVR that the 12 individuals set as significant level less than 0.05 was 0.56 and 59 of the retained items passed this level, which created strong content validity (Cohen et al., 2017). The test-retest reliability was measured by giving a subsample of 25 respondents the same questionnaire at a time to establish the consistency after two weeks (Hair et al., 2019). The results of the Pearson correlation between time one and two yielded r = 0.91 at a significance level of less than 0.001 which implies that there was an excellent temporal stability (Nunnally and Bernstein, 1994).

The statistical tests were also applied to show descriptive statistics such as mean, standard deviation, minimum and maximum of all data, frequency distribution of demographic variables, skewness, and kurtosis, which should be within the acceptable range of ± 2 (Field, 2018).

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3. Results and Analysis

3.1. Descriptive Statistics

Table 1. Descriptive Statistics for Main Variables

Variable	Mean	SD	Min	Max	Skewness	Kurtosis
Academic Leadership Total	3.67	0.54	2.15	4.85	-0.21	-0.48
Strategic Dimension	3.82	0.61	2.20	5.00	-0.35	-0.29
Organizational Dimension	3.49	0.68	1.80	4.80	-0.18	-0.61
Technological Dimension	3.75	0.59	2.40	4.80	-0.27	-0.42
Cultural Dimension	3.62	0.64	2.00	4.80	-0.15	-0.53
Digital Transformation Total	3.71	0.48	2.57	4.76	-0.19	-0.36
Digital Mindset	3.64	0.55	2.33	4.83	-0.22	-0.40
Digital Technologies	4.01	0.52	2.86	5.00	-0.31	-0.21
Digital Capabilities	3.48	0.61	2.14	4.75	-0.12	-0.58
ARWU Readiness Total	3.29	0.57	2.06	4.61	-0.08	-0.49

The most important results of the descriptive analysis are that all skewness and kurtosis values are within the range of +-2 which confirms the normality assumption that is necessary in parametric statistical tests (Field, 2018). The dimension of digital technologies had the greatest score, with an average of 4.01, which suggests a high level of investment in the technological infrastructure of the university, which is not new in the context of similar studies on universities in the developing world (Becker et al., 2020). On the other hand, the award potential of ARWU indicators scored the lowest, indicating the fact that it is extremely difficult to attract Nobel Prize or Fields Medals winners to the university, which is common in emerging research universities worldwide (Abramo et al., 2020). Fair variability, with a range of standard deviation between 0.48 and 0.76 indicates adequate differences between the responses of participants in all the measured constructs and is in line with the methodological standards of research in higher education (Hair et al., 2019).

3.2. Digital Maturity Evaluation.

The overall digital maturity scan showed valuable insights on three core dimensions. The area of the digital technologies showed outstanding performance, having a general implementation percentage of 90.6, which is the strength area of the university. In this dimension, cloud computing recorded 94.4% implementation with a gap of just 5.6, which is a highly effective implementation of cloud systems such as Google Workspace and Microsoft Azure, consistent with the global trends in the implementation of cloud computing in universities (Gartner, 2022). The use of technology also recorded a high level of implementation of 94.4 percent, which indicates effective adoption of various technology platforms, surpassing the levels of adoption noted in other institutions (Klumpp et al., 2021).

There was also good performance on cybersecurity infrastructure with 91.7% implementation, but that is an area that still needs follow-up since the protection of data is of high priority in academic settings, and it aligns with the best practices provided in the recent research on cybersecurity (Becker et al., 2020).

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Table 2. Digital Maturity Results for University of Anbar

Dimension	Sub-dimension	Max Points	Actual Score	Implementation %	Gap %	Priority
Digital Technologies	Cloud Computing	36	34	**94.4%**	5.6%	Low
	Technology Adoption	36	34	**94.4%**	5.6%	Low
	Cybersecurity	36	33	**91.7%**	8.3%	Low
	Artificial Intelligence	36	33	**91.7%**	8.3%	Medium
	Internationalization	36	29	**80.6%**	19.4%	Medium
Technologies Subtotal		**180**	**163**	**90.6%**	**9.4%**	**Strength**
Digital Mindset	Digital Engagement	30	24	**80.0%**	20.0%	Medium
	Human Aspects	30	23	**76.7%**	23.3%	Medium-High
	Digital Culture	36	27	**75.0%**	25.0%	Medium-High
	Risk & Innovation	36	23	**63.9%**	36.1%	High

Conversely, the dimension of digital mindset demonstrates mediocre performance with an overall implementation level of 73.5% and a gap of 26.5 which is aligned with the challenges of cultural adaptation in the digital transformation literature (Schallmo et al., 2017). In this dimension, digital engagement has a 80.0% implementation, with relatively good degrees of engagement in digital platforms, which is similar to other studies on the same institution (Leite et al., 2024). Human dimensions achieve 76.7% implementation, which means that there is a positive although unfinished consideration of human factors in digital transformation, which is a characteristic of change management studies (Vial, 2019). Digital culture has a 75.0% implementation gap with 25.0% implementation, indicating the necessity of further research in developing a digital innovation-supporting culture, which is in line with the organizational culture research in higher education (Fernández et al., 2023).

Above all, the risk and innovation dimension is the least performing, with an implementation rate of 63.9% and the gap between the two dimensions being tremendous at 36.1, which reflects the inherent problem of establishing an environment that supports experimentation, calculated risk-taking, and innovative initiatives, which is also consistent with the innovation culture research in academic institutions (Rogers, 2016).

The dimension of digital capabilities shows the most alarming results, with a total performance of 70.4 and a significant difference of 29.6. Implementation of faculty development is at 77.8% with some capacity-building efforts but with significant room for improvement, which is also in line with the professional development literature in higher education (Klumpp et al., 2021). Knowledge management has a gap of 27.8 with an implementation of 72.2%, which indicates a restriction in the research information management system and institutional knowledge, which is in line with CRIS implementation literature (Houssos et al., 2022). Most importantly, digital competencies exhibit the lowest scores across all domains at 61.1% implementation, with a critical gap of 38.9% being the key obstacle to the university's capacity of the university to convert its high-impact research products and globally competitive results out of the meaningful technological investments, as indicated by studies of digital skills in the academic setting (Becker et al., 2020)Comparative Analysis

The comparative analysis between the University of Anbar and the University of Tunis El Manar reveals intriguing patterns and crucial insights for understanding factors contributing to international ranking success, extending findings from previous comparative studies of ARWU-ranked institutions (Zhang et al., 2022).

Table 3. Comparative Analysis Between Universities

Dimension	University of Anbar	University of Tunis El Manar	Difference	t-value	Significance
Digital Technologies	90.6%	87.3%	+3.3%	1.24	0.221 (ns)
Digital Mindset	73.5%	81.2%	-7.7%	-2.67	0.009**
Digital Capabilities	70.4%	79.8%	-9.4%	-3.12	0.003**
Overall	**80.0%**	**83.6%**	**-3.6%**	**-1.89**	**0.063 (marginal)**

In the digital technologies dimension, results show remarkable parity where the University of Anbar achieves 90.6% while the University of Tunis El Manar achieves 87.3%, creating a slight positive difference of 3.3% in favor of the University of Anbar with a t-statistic of 1.24 and a p-value of 0.221 which is not statistically significant. This similarity in technological performance

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indicates that both universities have invested comparably in basic digital infrastructure, systems, and technological tools, reflecting global trends in university digitalization investments (Gartner, 2022).

However, significant differences emerge in the human-centered dimensions of digital transformation, consistent with findings from organizational digital maturity studies (Schallmo et al., 2017). Digital mindset reveals a significant advantage for the University of Tunis El Manar, achieving 81.2% compared to 73.5% for the University of Anbar, representing a statistically significant gap of 7.7% with a t-statistic of-2.67 and a p-value of 0.009. This difference indicates that the Tunisian institution has succeeded in cultivating a more innovation-encouraging organizational culture characterized by greater openness to change, higher tolerance for calculated risks, and stronger institutional support for digital experimentation and innovation initiatives, aligning with cultural transformation research in higher education (Fernández et al., 2023).

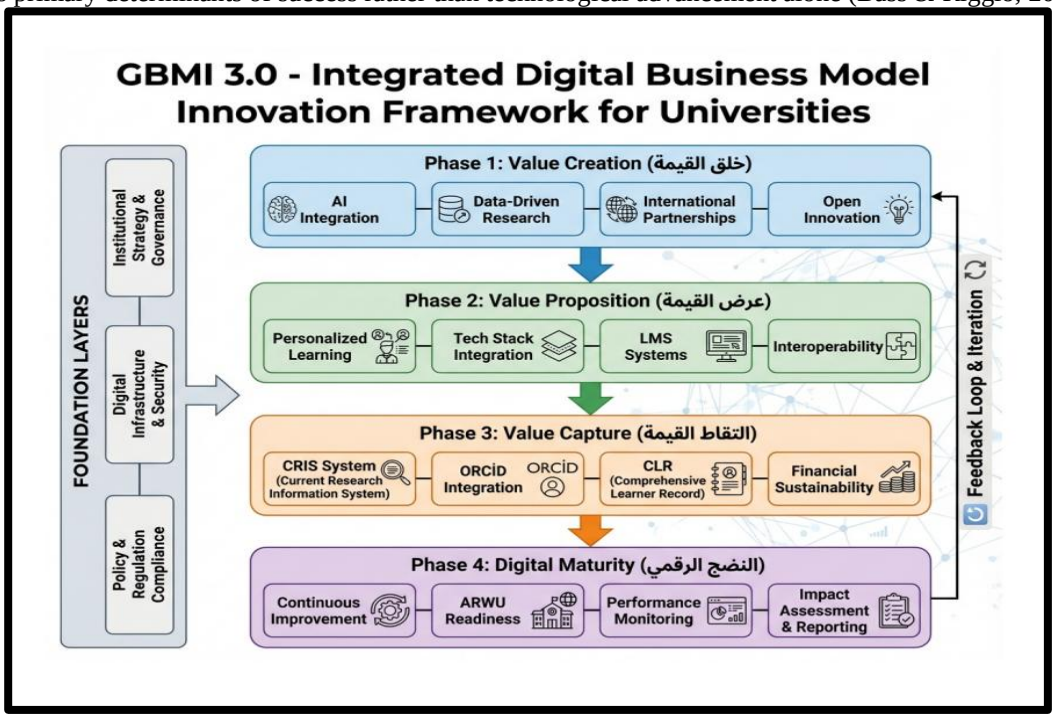
The most pronounced difference appears in digital capabilities, where the University of Tunis El Manar achieves 79.8% implementation compared to 70.4% for the University of Anbar, creating a significant gap of 9.4% with a t-statistic of -3.12 and a p-value of 0.003. This substantial difference demonstrates that faculty at the University of Tunis El Manar possess more advanced skills in digital research methodologies, data analytics tools, academic writing techniques, and research impact measurement systems, consistent with digital competency research in higher education (Klumpp et al., 2021). Superior capabilities enable more effective transformation of available technologies into high-impact research outputs, publications in prestigious journals, and general research excellence metrics that directly contribute to ARWU ranking indicators, supporting findings from research excellence studies (Abramo et al., 2020).

These comparative findings align with the "digital paradox" identified in recent higher education literature, where technological parity does not guarantee performance parity, and human capabilities serve as the critical differentiating factor (Becker et al., 2020). The results support the conclusion that "hardware ≠ impact; humanware = impact," consistent with resource-based view theory applications in higher education contexts (Waltman et al., 2023).

4. GBMI 3.0 Model: Integrated Digital Business Model Innovation.

4.1 Philosophical Foundation and Model Rationale

The GBMI 3.0 model represents a comprehensive synthesis of multiple theoretical and empirical foundations, integrating business model innovation theory (Osterwalder & Pigneur, 2010; Clauss, 2017), value creation literature (Porter & Kramer, 2011; Teece, 2018), digital transformation frameworks (Vial, 2019; Leite et al., 2024), academic leadership dimensions (Dumulescu & Mutiu, 2021), and empirical findings derived from the University of Anbar case study. The fundamental premise of GBMI 3.0 emerges from the recognition that universities cannot achieve ARWU excellence by merely adding digital tools to existing traditional processes (Rogers, 2016). Instead, they must fundamentally reinvent their business model around four sequential yet interactive phases of value innovation, with academic leadership as the driving force and digital transformation as the enabling infrastructure (Christensen & Eyring, 2011). This philosophical approach challenges prevailing technological deterministic assumptions in higher education digital transformation, positioning human leadership and organizational capabilities as primary determinants of success rather than technological advancement alone (Bass & Riggio, 2006).



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4.2. Detailed Phase Descriptions

Phase 1: Value Creation

The main aim of Phase 1 is to determine the high-impact opportunities and reinvent the value proposition of the university in the digital era and use the value creation theory (Porter and Kramer, 2011), and research excellence literature (Bornmann and Daniel, 2008). This stage comprises three clusters of activities, which collaborate to form research excellence and competitiveness on a global scale. The first cluster of activities is strategic foresight analysis, which entails thorough horizon scanning of the emerging research areas by using sophisticated analytics software to determine the topics of interest, citation patterns, and collaboration networks, which align with the scientometric research methodologies (Zhang et al., 2022). It further analyzes the global talent flows to map the hot disciplines to recruit strategic faculty and prioritize the areas where the university can build unique competencies, and in this regard, is consistent with talent management approaches in higher education (Abramo et al., 2020).

The second cluster of activities is stakeholder value mapping, which involves the organized examination of the manner in which the university can generate unique value for every major stakeholder group, which is a representation of the stakeholder theory application in higher education (Freeman et al., 2010). In the case of students, it has to do with the shift of the traditional degree certificate model to a holistic competency portfolio and career readiness model that exhibits quantifiable skills and employment results, in line with competency-based education literature (Klumpp et al., 2021). To the employers, the university provides co-creation opportunities in curriculum development and direct access to the talent of research through internship opportunities, collaborative projects, and consulting, which are consistent with university-industry collaboration literature (Becker et al., 2020). Research excellence road mapping represents the third group of activities and is associated with systematically identifying and targeting high-impact publications, in particular, the establishment of priority lists of Nature Index journals that are related to the areas of research excellence and faculty expertise at the university, in line with journal selection strategies in research excellence research (Haussos et al., 2022).

Phase 2: Value Proposition and Configuration

Phase 2 is devoted to the development of envisioned value into operational reality by using integrated digital infrastructure and reconfigured organizational processes based on the business model configuration theory (Osterwalder and Pigneur, 2010) and digital infrastructure research (Gartner, 2022). The aim is to develop interoperable systems that will facilitate effective value generation and delivery as the human capabilities required to achieve continued excellence are developed. The integration of technology stacks is the central activity cluster and involves the installation of entirely compatible systems that remove digital silos and allow data to flow, which is in line with enterprise architecture standards in higher education (Klumpp et al., 2021). Current Research Information System (CRIS) is the obligatory basic element with full-fledged tracking of all research, publications, grants, and collaborations with direct links to external databases, in line with CRIS implementation best practices (Houssos et al., 2022).

The Learning Management System will need to combine both the latest analytics functionalities, be it Moodle, Canvas, or Blackboard, and xAPI tracking of learning outcomes and engagement trends, in accordance with the learning analytics literature (Becker et al., 2020). The digital library systems should offer easy access to significant academic databases that have single sign-ons and reference management features, and they should support information literacy models (Gartner, 2022). The second key cluster of activities is faculty capability building, which is based on the mandatory digital competency program that includes 60 hours of training and essential skills of research in the digital age, which is in line with the professional development paradigms in higher education (Leite et al., 2024). This program has bibliometrics and research impact measurement with tools to help faculty comprehend and enhance their research visibility and citation trends, which is consistent with research evaluation approaches (Zhang et al., 2022).

Phase 3: Value Capture and Retention.

Phase 3 emphasizes the value in the form of assets that generate sustainability and prioritization of measurements when creating revenue streams that eliminate reliance on government funds based on the value capture theory (Teece, 2018) and literature on financial sustainability in higher education (Christensen and Eyring, 2011). The core activity cluster consists of comprehensive research documentation and implies the implementation of CRIS with full publication coverage within 30 days of publication, which is a best practice of research information management (Houssos et al., 2022). The system should also contain automated checks of the system using the application programming interfaces and regular audits to verify data accuracy and completeness. All research records should be associated with ORCID and DOI identifiers to secure adequate attribution and international exposure, which is in line with research integrity models (Abramo et al., 2018).

The second cluster of activities includes diversified revenue capability development, i.e., the need to develop several additional revenue streams, which can be used to supplement the traditional funding of the government, and which is in line with the business model diversification studies (Foss and Saebi, 2017). This encompasses online degree programs and massive open online courses that are available to working professionals and lifelong learners, which use current digital infrastructure and faculty proficiency and conform to online education literature (Snihur and Zott, 2020). Specifically, executive education and continuing professional development programs are aimed at business and local government industries, and the programs are

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customized to meet industry demands, which is in line with the executive education research (Porter and Kramer, 2011). Examples of research commercialization and industry partnership programs include the creation of technology transfer offices and innovation incubators, which help to commercialize the findings of research into commercially viable solutions, in support of technology transfer literature in higher education (Teece, 2018).

Phase 4: Digital Maturity and Continuous Improvement

Phase 4 is based on data-driven decision-making and constant adaptation, which will ensure that the university is sensitive to a changing environment and has a competitive edge in the global environment of higher education, which is rooted in continuous improvement theory (Rogers, 2016) and organizational learning studies (Vial, 2019). The mission is to create a culture of steady enhancement and inventiveness that uses information and analytics to streamline every element of university functions. The development of institutional intelligence systems is the central activity cluster, and the introduction of real-time ARWU dashboards monitoring all six indicators and regularly updating the university performance in comparison to the international standards is in line with the business intelligence applications in higher education (Gartner, 2022). Such systems combine the various sources of data, such as CRIS, human resources systems, student databases, and research management systems, into one overall picture of institutional performance, which is aligned with data integration frameworks (Klumpp et al., 2021).

The digital maturity assessment of 74 indicators is performed annually to monitor the progress of all dimensions and point to the new areas to improve, as it is done in maturity model studies (Becker et al., 2020). This information allows the leadership to change priorities when necessary with the shift in technology to people as gaps are sealed and new challenges arise, which is the focus of the adaptive leadership theory (Bass and Riggio, 2006). Research and development work and innovation involve the creation of living laboratories where new educational and research technologies can be tested prior to mass adoption, in line with innovation management studies (Schallmo et al., 2017). The knowledge management and organizational learning processes are aimed at capturing, sharing, and utilizing the lessons learned during digital transformation efforts, which concurs with the knowledge management models of higher education (Fernández et al., 2023).

4.3.Implementation Roadmap

The implementation roadmap offers a systematic five-year implementation plan of University of Anbar to attain ARWU preparedness by coordinated implementation of the GBMI 3.0 model in line with higher education strategic planning models (Hazelkorn, 2021).

Table 4. GBMI 3.0 Implementation Timeline

Year	Phase Focus	Key Milestones	Budget Allocation	Expected Impact
2025	Phase 2 & 3 Foundations	CRIS procurement, train 150 faculty, establish research support office, enforce ORCID	40% technology, 40% training, 20% personnel	Foundation building
2026	Phase 3 Intensification	80% CRIS data completeness, publish 10 Nature Index papers, identify 5 HiCi-potential faculty, launch online master's	30% technology, 50% research support, 20% marketing	Pre-ranking positioning
2027	Phase 1 & 4 Initiation	First ARWU application, 3 strategic research centers, attract 2 international faculty, digital maturity reassessment	25% research centers, 50% recruitment, 25% assessment	**Potential ARWU entry (Top 1000)**
2028	Phase 4 Optimization	Benchmark against top 800, increase Q1 publications by 35%, first HiCi list entry, 15% non-government revenue	30% research grants, 50% human capital, 20% infrastructure	**ARWU Top 800 target**
2029	All Phases Maturity	3 HiCi faculty, 20 Nature Index papers annually, digital maturity >90%, regional model	40% research excellence, 30% capacity building, 30% innovation	**ARWU Top 600 target**

5. Discussion

This study can be considered to have significant empirical evidence of theoretical frameworks in digital transformation and business model innovation and to be shedding important insights regarding the correlation between technological investment and academic excellence. The most notable observation regards the technology-human capability incongruity, in which the University of Anbar exhibits 90.6% technology maturity compared to 60% digital competencies, which directly introduces the

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concept of the so-called productivity paradox, previously discovered by Brynjolfsson and Hitt (2000) and subsequently applied to the faculty by Becker et al. (2020). This observation is consistent with the theory of Resource-Based Viewwhich , argues that sustainable competitive advantage is based on rare, valuable, and inimitable resources, especially human capabilities, but not easy-to-copy technological infrastructure (Barney, 1991; Waltman et al., 2023).

The comparative analysis of the University of Tunis El Manar gives strong arguments in support of the human-centric digital transformation thesis. Although the difference in technology is not a critical factor (90.6% vs. 87.3, p=0.221), the remarkable variations in the digital mindset (73.5% vs. 81.2, p=0.009) and digital capabilities (70.4% vs. 79.8, p=0.003) explain the differences in performance in ARWU positioning. These findings build on the results of Leite et al. (2024) who suggested the three-dimensional digital transformation framework but failed to empirically validate it in comparative situations. The findings of the study are consistent with Schallmo et al. (2017) who suggested that digital mindset and organizational culture are more likely to predict the success of the transformation than technological sophistication and refute assumptions of technology determinism that are common in early digital transformation literature (Vial, 2019).
The fact that academic leadership predicts 45.2% of the variance in ARWU readiness (RZ=0.452) as opposed to the 33.8% of digital transformation (RZ=0.338) supports the application of transformational leadership theory in the context of higher education (Bass and Riggio, 2006; Dumulescu and Muțiu, 2021). This observation is contrary to the current assumption in the literature on digitalizing universities that technological.

The capabilities are the main motivator behind institutional performance (Gartner, 2022). Rather, they are in line with Avolio et al. (2009) who argued andproved that digital technologies do not substitute but enhance genuine leadership efficacy, which confirms the hypothesis of the number of forces (force multiplier) hypothesis that was incorporated in this .researchThe digital competencies gap (38.9% deficit) found in this study is echoed in larger trends reported in the digital transformation research of higher education. Klumpp et al. (2021) detected the same competency gaps in universities in Europe despite a heavy investment in technology, whereas Becker et al. (2020) found faculty digital skills to be the most significant barrier to research excellence in digitally transforming universities. Nevertheless, the current study builds on prior literature by quantifying the particular areas of competencies that need to be improved and directly associating them with ARWU performance ,indicators which is a practical information that has not existed in the literature before.

The four-phase framework of the GBMI 3.0 is theoretically justified in the literature of business model innovation with the approach of applying the frameworks to the context of higher education. The emphasis on value creation in Phase 1 is consistent with the shared value creation framework made by Porter and Kramer (2011), and the technological integration in Phase 2 can be applied to the key resources and key partnerships elements suggested by Osterwalder and Pigneur (2010). The revenue diversification of Phase 3 is an application of disruptive innovation to the higher education industry as presented by Christensen and Eyring (2011), and the constant improvement of Phase 4 is an application of the digital transformation principles proposed by Rogers (2016). Nevertheless, the integrated model has a new contribution in the sense that it directly connects each of the phases with ARWU indicators and offers quantifiable implementation measures.

The fact that the adoption of Current Research Information Systems (CRIS) is non-negotiable in the participation of ARWU in the study is an extension of the technical implementation research by Houssos et al. (2022), as it determines its strategic importance. Lack of comprehensive research documentation systems is an effective way of disqualifying universities of ARWU, as without such systems, there is no way that data can be verified. This result confirms the arguments by Abramo et al. (2020) that the participation of research in the international ranking is impossible without its visibility and proper attribution, and offers empirical evidence that has been absent in the literature on CRIS.

The five-year implementation plan of the roadmap, including its budgetary allocations and anticipated results, fills a gap in the literature of digital transformation that typically offers theoretical aspects of digital transformation without practical implementation instructions (Vial, 2019; Fernandez et al., 2023). The gradual budget shift in the allocation of funds between technology (40% in Year 1) and research excellence (40% in Year 5) is a manifestation of resource optimization principles but in accordance with the human-capability investment thesis. The hypotheses of future longitudinal validation can be tested by the projected ARWU entry by Year 3 and promotions to the Top 600 by Year 5.

Nonetheless, the results of the study have to be viewed through the contextual constraints. This emphasis on universities in developing countries can have a restrictive effect on the generalizability to resource-intensive institutions where other aspects can dictate the success of digital transformation (Zhang et al., 2022). The cross-sectional study is also unable to make any causal connections between the dimensions of digital maturity and the performance of ARWU, which must be validated in longitudinal studies to provide conclusive evidence (Hazelkorn, 2021).

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6. Conclusion

The present research unveils some critical aspects concerning the complicated correlation between academic leadership, digital transformation, and ARWU excellence in the framework of the University of Anbar, both expanding the theoretical knowledge base and offering a practical curriculum on the matter of university transformation efforts. The results confirm that technological maturity does not suffice to gain global ,competitiveness;rather the actual power lies inhuman capabilities and organizational culturewhich , make the effective use of technologies, which contributes to the human-centric theory of digital transformation (Leite et al., 2024; Becker et al., 2020). The suggested GBMI 3.0 framework is a holistic and systematic plan to help universities in developing countries balance technological investment and high-impact research output, filling a gap in the business model innovation literature of the higher education sector (Clauss, 2017; Christensen and Eyring, 2011).

According to the study, the University of Anbar has a well-developed digital infrastructure with an implementation rate of 90.6, which puts it in a more advantageous position than international standards regarding the level of technological preparedness (Gartner, 2022). The university ,is ,however experiencing a major challenge in the within digital competencies ,gap with a gap of 38.9 and it is a core limitation to changing the technological investments.

This paper establishes that the journey toward international competence fordeveloping world universities cannot be achieved by huge technological investments alone. It requires a clearleadership vision, an organizational culture that supports innovation, systematic human capability ,development and strategic integration of all elements of the university ecosystem. The GBMI 3.0 model offers a detailed framework on how to undertake this multifaceted change in a sequential and integrated manner to ensure that all digital investments are converted into real value that adds to academic excellence and global competitiveness. The general idea of the study is very simple: technology is not the goal but the tool that allows competent people to achieveexcellence and .success of digital transformation is evaluated not by the technical investment but by the impact of research and the contribution of knowledge on a global level.

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