Fusion of Faculties: Harmony Across Academic Boundaries

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Abstract

Higher education institutions face increasing questions about what is taught inside university buildings, whether programs remain relevant to societal challenges, and the role of faculties in teaching and research. These questions mirror similar boundary-breaking drives in other sectors of society, such as hybrid formats in library services; defragmentation within the media landscape; the rise of hybrids in commerce, finance, medicine, law, art, and design; blurring between commodities, products, and services; and the fusion of artificial intelligence with other forms of creativity. Taken together, these trends signal a demand for a more holistic, integrated approach to knowledge and knowledge formation within institutions of higher education that can benefit the public and private sectors. These contextual developments, together with an interest in broadening the impact of knowledge-generation activities within higher education institutions, motivate the pursuit of a contemporary understanding of the fusion of faculties. The exploration of interdisciplinary work in higher education has a long history, including substantial analyses of related phenomena such as inter- and transdisciplinary approaches. Similarly, the historical evolution of interdisciplinary work inside and around universities reveals much about the dynamics presently governing faculties in higher education. From a conceptual and analytical perspective, it is also valuable to look beyond the historical development to the more fundamental theoretical considerations that help to refine the notion of faculties and deepen understanding of the kind of cross-faculty integration that might be involved.

Keywords: Interdisciplinarity, faculty fusion, higher education, boundary-breaking, transdisciplinarity.

1. Introduction

Institutional boundaries inhibit knowledge creation, hinder education, and stymie innovation. Strengthening institutional connectivity, augmenting cross-boundary collaboration, and blurring disciplinary and operational borders remain urgent aspirations for many universities, especially within the contemporary environment of systemic risk, converging crises, and complex global challenges. Responding to these imperatives, this inquiry investigates the maximal fusion of faculties.

Fusion of faculties denotes a state in which the disciplines, fields, and areas served by academic faculties, schools, and colleges are radically integrated across the breadth of the institution. Prominent examples include schools of environment, public policy, systems and design, conflict studies, information, and health. Four enhancing dimensions shape the trajectory of extreme interdisciplinarity (Farrow McNeely et al., 2018). One is the degree of fusion across disciplines; extreme disciplinarity corresponds to a single, institution-wide discipline. A second dimension concerns the breadth of the integration sought; transdisciplinary, for instance, signifies a wide-ranging effort to engage and conceptualise multiple disciplines. A third dimension entails the strength of institutional connection and integration

associated with the effort; federated initiatives, for instance, simultaneously maintain and emphasise the underlying institutional separateness of faculties. A fourth dimension considers the nature of the integrated programming pursued; the integration of structures, activities, or practices, such as governance, funding, and research, constitutes the most extensive form of cross-institutional intermingling.

The inquiry canvasses the multiple—at times countervailing—mechanisms, enablers, constraints, risks, benefits, and impacts implicated in the ongoing institutional pursuit of this aspirational state (Heinrich, 2018). Knowledge creation thrives at the intersection of diverse disciplines, yet higher education institutions remain stubbornly bound by the disciplines they have historically cultivated. The trend toward ever-greater disciplinary and operational specialisation continues to deepen. Unprecedented challenges confront societies and systems across the globe—including climate change, demographic transformations, conflict, cyber-interdependence, rapid technological and socio-economic changes, and crises in public health, mental health, and well-being. Contemporary, transboundary research cannot adequately address these interconnected dilemmas within the conventional, narrowly defined

parameters of the discipline. Affirmative connectivity, collaboration, and integration across boundaries— broadening and ultimately fusing disciplines to encompass multiple knowledge domains or even a single set of concepts, frameworks, and tools— become prerequisites for tackling systemic risk holistically.

The merger of faculties thus becomes a potent and timely area of study under these auspices. Although there has been much enthusiasm, funding, research, curricula, and activities have not matched this hype across faculties, schools, departments, and units in higher education. On the other hand, "faculty" – the unit within which knowledge ever remains most fully encapsulated and transmitted – has received much less attention. The rapidly consolidating academic field of university studies has begun to recommend a much broader conceptualisation of the university in terms of its intended object of study. The traditional polytechnique, or technopole, is to be understood as an integrated, interconnected network of differentiated domains of science and industry. The post-university proposal, rarely espoused despite our efforts, to study the interconnectedness of such institutional typologies renders university studies fantasmatically deficient. A far deeper examination of inter-institutional and boundary-crossing interactions among faculties/fields/disciplines at the university level in field/genre analysis is warranted.

2. Conceptual Foundations of Interdisciplinarity

In academia, the promotion of interdisciplinary research has emerged as a priority at institutions worldwide; many university leaders are increasingly aiming to foster collaboration across diverse fields. The concept has various definitions. The National Academy of Sciences describes interdisciplinary research as that involving "the integration of information, data, techniques, tools, perspectives, and concepts from two or more disciplines to advance fundamental understanding or solve problems whose solutions are beyond the scope of a single discipline". Barbara W. Tuckman summarises the mainstream view of interdisciplinarity as situated between two extremes: pure discipline and amalgamation of disciplines.

Interdisciplinary research is critical, as many of contemporary society's most challenging and crucial problems extend beyond the confines of traditional disciplinary boundaries; they are complex, multidimensional, and systemic. Similarly, much innovation, creativity, and progress flow from the

intersection and recombination of knowledge, ideas, methods, and concepts. Thus, expert researchers assert that the research fusions likely to yield the most profound results—science/philosophy, sociology/political science, arts/political science, ethics/economics, medicine/shadow economy, psychology/management and others—take place at the edges of disciplines (Farrow McNeely et al., 2018).

2.1. Historical Perspectives on Faculty Integration

Although today's universities and colleges offer an increasing number of interdisciplinary degree programs, previously integrated curricula maintained separate disciplinary identities. In the late 1960s and early 1970s, the faculty development literature proposed several models of cross-boundary movement and synthesis that remain relevant. These models suggest that faculties might:

- reunite under integrative colleges, identifying and synthesising principles common across the disciplines;

- invite teachers from other faculties to participate in seminars, which could generate non-displaced or co-displaced disciplinary-bridging initiatives; or

- combine with research centres in the adjoining disciplines, thereby facilitating both interchange and synthesis (Park, 1979).

These ideas apply not only to academic faculties but also to administrators and other stakeholder groups.

The interdisciplinary dilemma extends inter-institutionally, as demonstrated by attempts to merge Columbia University's School of Social Work with its School of Public Health, Harvard University's School of Business Administration with its School of Government, and McGill University's Faculty of Applied Science with its Faculty of Arts. Nationally funded transdisciplinary research networks led by the National Research Council of Canada and local collaborative research groups posed similar challenges in the 1960s and 1970s. Early Canadian debates concerning university development and structure addressed the nature and sustainability of the boundaries that define institutional identities (Huelin, 2003).

2.2. Theoretical Frameworks for Boundary-Broadening

Higher education institutions situated at the crossroads of disciplinary fields are taking a systemic approach to an ecological model of education that tackles multifaceted global issues. Interdisciplinary conversations among

autonomous yet aspiring academic parties can benefit from theoretical frameworks that explicitly consider modes of integration. Theoretical traditions from the educational continuum are relevant, particularly liberal education and its enduring influence on the conceptualisation of good learning. An ecological model of education can be considered a conceptual framework in its own right. Within transdisciplines, collaborative methodologies form the core of the integration endeavour, highlighting the social aspect of knowledge. The polysemic nature of the term faculty should be kept in mind when referring to transdisciplinary collaborations that occur within degrees or centres, or among institutional actors. A comprehensive overview of the available literature is essential before identifying the supporting transdisciplinary methodologies that could meaningfully complement either the educational or the ecological conceptualisation of integration (C. Burch et al., 2016; Dillon et al., 2014).

3. Mechanisms of Fusion in Higher Education

Mechanisms and arrangements toward academic integration can be established through a variety of formal and informal practices. Depending on the desired level of integration, a campus may adopt different structural models for faculty hiring, program development, research initiatives, library or studio access, and shared space allocation. In the most integrated arrangements, faculty are appointed, either singly or jointly, to multiple departments or disciplines; a single course or program carries credit in more than one academic area; grant funds target issues across diverse fields; and space housing shared resources is made available to the entire campus community.

Scholarship on higher education recognises a substantial body of knowledge that describes mechanisms and practices that facilitate boundary crossing. Organisational forms such as umbrella colleges, schools of interdisciplinary studies, and other institutional variations can increase the likelihood of collaboration among designated disciplines. Notable structures designed to break down traditional divisions include cross-listed or concurrently taught courses, joint or dual degree programs, general education or core curricula oriented toward societal challenges, and transdisciplinary labs or research initiatives organised around complex topics. The development of shared facilities (e.g., fabrication shops, makerspaces) has transformed the surface model by enabling the exchange of methods rather than content. The

emergence of learning cafés, brown-bag seminars, and other informal venues represents important innovations in this regard. (Mae Abdallah, 2011)

3.1. Structural Arrangements and Governance

Higher education institutions organise themselves in myriad ways, such as through colleges or departments, faculties or schools, and programs or divisions. In almost all cases, departments representing different disciplines provide the bulk of instruction and determine credit allocations toward degrees. Nevertheless, faculty fusion entails engaging multiple academic units simultaneously, beyond merely appointing faculty to multiple departmental homes. Arrangements for integration can include joint appointments of faculty across programs, cross-listing of courses, provision of shared academic services for cluster development (e.g., in pedagogical support, research grant acquisition, outreach to decision-makers, software and equipment acquisition, or studio space), and governance arrangements in which faculty from multiple academic units participate side by side in both strategic and operational decision-making across a number of the aforementioned areas.

Many institutions involve faculties and programs from the social and life sciences in developing joint support for interdisciplinary education and research. Hence, integrating faculties with a broader range of disciplinary orientations beyond the sciences would enable the addressing of a wider spectrum of public policy concerns, thereby enhancing overall societal relevance. Such complex collaborative efforts are often influenced by expanded external funding. Initiatives to spur engagement across faculties and programs representing the social sciences, policy studies, and community engagement proliferated in the 1980s, yet such activities remain decidedly modest at most institutions (Kroll & Schubert, 2023).

3.2. Educational Programs and Curriculum Design

Many learning opportunities can be structured as either a traditional or an integrated curriculum. In conventional programs, courses are separated by discipline. In integrated programs, linkages are made across courses, curricula, and disciplines. The early integration of coursework from two disciplines within the same degree broadens students' perspectives and opens up a wider range of options. Collaborative teaching across disciplines

offers more opportunities for cross-disciplinary engagement.

An interdisciplinary major or minor available to students pursuing degrees outside the home discipline is a classic boundary-spanner. Such initiatives are supported by the literature (Chesley et al., 2018). Students learn about the value and use of areas beyond their own via their college programs and develop the ability to solve problems that extend across areas. In program architecture, flexibility in transferring credit from the home program to an integrated, co-major program enhances uptake. Fusion is fostered by shared program-level learning goals and learning outcomes. Modular learning objectives facilitate articulation of theme-based, co-sessional, co-teaching, and co–capstone course provision.

3.3. Research Collaboration and Resource Sharing

Academics at Fusion of Faculties increasingly use shared research infrastructure, such as collaborative training and supervision platforms, interdisciplinary seminars, mega-grants, policy shops, and creative computing environments. Many of these structures are more amenable to collaborative work than traditional disciplinary boundaries (L Eddy & L. Garza Mitchell, 2012). Higher education institutions are now

building more egalitarian and cross-unit partnerships that pool advanced research facilities at regional, national, and international scales. Academic leaders increasingly recognise that university-wide and cross-university co-leadership, rather than isolated disciplinary fiefdoms, is vital for transformative research. Hence, knowledge co-creation across diverse public, private, regional, and national sectors is increasingly urgent. These developments warrant deeper investigation. On the one hand, research collaboration and resource sharing remain underexplored in the higher education literature; on the other hand, significant new approaches to boundary-breaking academic research, including knowledge co-creation and transformative practices directed towards public benefit, have surfaced since the turn of the millennium.

Research collaboration within and between institutions typically focuses on improving or enabling the conduct of research rather than on higher education per se; for instance, on the establishment of collaborative research centres, thematic investment strategies for new institutions, mega-grants, new funding modes, and joint appointments rather than on educational programs and curricula. In the context of post-World War II national reconstruction and innovation systems, a focus on research

rather than education remains legitimate. Such views also align with the shift from knowledge-based to increasingly cross-sector models of knowledge co-creation, where knowledge is no longer considered the exclusive province of academia. Academic collaboration across faculties and communal research infrastructure thus warrants greater attention. University strategies that explicitly frame higher education, as well as research and knowledge-transfer alumni environments, likewise merit scrutiny. The advent of higher education collaboration meshes with the notion of funding instead of education–the so-called "third mission" or "fourth fund" megatrend prevalent in several regions and systems since the mid-1990s.

3.4. Teaching and Learning Innovations

Educators increasingly embrace boundary-spanning pedagogies such as team-teaching, problem-based learning, and integrated assessment strategies to help learners tackle complex real-world problems, reflect critically on their use of multiple perspectives, and make systematic connections between disciplines. Team-teaching arrangements bring together instructors from different disciplines to co-design and co-deliver educational experiences. Problem-based learning engages students with an issue relevant to multiple subjects, asking them to identify solutions while integrating knowledge from each field. Assessment schemes, including projects and portfolios, align separate but connected tasks according to a common set of skills or competencies (Chesley et al., 2018), enabling participants to recognise greater coherence across curricular boundaries while supporting the development of an integrated set of capabilities.

4. Challenges and Risks

Coordinated management of disciplinary convergence in academia and public discourse expands knowledge stock (Lenhart & Bouwma-Gearhart, 2022). Receptivity to boundary-crossing initiatives varies considerably across institutions and stakeholders. Colleagues invoke "stovepiping" of institutional silos as a barrier to development. Transformation engenders reconfiguration of human and material resources. Faculty and administrators consider alignment with academic and administrative hierarchies. Institutions prioritising the integration of STEM education deploy strategies to engage partners from the liberal arts community. All stakeholders hold differing perspectives on the formation of the pedagogical centre and the transdisciplinary space. Integration of boundary-breaking scholarly work by politically and financially influential actors into the institutional psyche and

strategic articulation promotes continued investment.

4.1. Institutional Resistance and Cultural Change

Research also indicates that university transformations largely depend on an understanding of culture. Universities exhibit a degree of contextual difference, multicollectivity, and radical individuality that sets them apart from the standard organisational ideal. In this context, cohesion emerges as a particularly appropriate concept. It fosters identification in university communities, helping address unity and goal achievement among the involved actors. Cultural framing must therefore allow for the integration of a heterogeneous, highly ambiguous nature while also avoiding unrealistic assumptions of consensus and homogeneity. Existing models, while helpful for characterising the complexity of university development, nevertheless fail to encompass the highly variable disciplinary cultures and boundary conditions that remain crucial for functioning even at the level of the academic community (Krzywinski, 2016).

Identification processes are highly individual and can be influenced only indirectly by fellow members and the organisation itself. The cohesive culture model, while widely applicable, remains selective in its simultaneous need for context sensitivity. Furthermore, different types of organisations exhibit significant differences in their basic structures and culture, with universities presenting a configuration that markedly diverges from that of private enterprises. Cultural dynamics also seldom follow a top-down mechanism. Instead, they arise from the bottom up and are continuously shaped by all levels, while communication exerts a considerable influence on their formation. The frequent failure of change processes stems from the disregard of essential normative targets and excessive reliance on self-organisation. Many universities are sprawling, fragmented, and non-cohesive. Consequently, the exploration of cultural dynamics, different levels, and thematic topics appears more relevant than the search for a unifying and cohesive culture or a common set of values.

4.2. Assessment, Quality Assurance, and Accreditation

While the fundamental purpose of higher education remains unchanged—that is, to ensure the acquisition of knowledge, skills, and values through teaching and learning—educational needs continue to evolve in response to changing social and economic conditions. To remain relevant, higher educational institutions have

therefore begun to rethink modes of knowledge delivery and realign their systems accordingly (M. Selesho, 2013). Numerous restructuring strategies are documented in the literature on higher education systems and evaluation processes, including curricular assessment, governance reviews, teaching–learning materials reform, and institutional–educational support. These strategies reveal great diversity in stakeholder involvement, organised agendas, anticipated outputs, expected impact, and funding sources, yet almost all agree on the importance of assessment.

Accreditation is one mechanism for institutional assessment (Susan Brua-Behrens, 2003). It is an external quality-assurance process in which educational institutions or programs are evaluated by an external body against established standards. The Council for Higher Education (the highest authority in post-secondary education and training in South Africa) recognises that accreditation can positively impact the quality of education and training delivery in the country; therefore, it has set up the Higher Education Quality Committee (HEQC). As defined in the Higher Education Act No. 101 of 1997, the HEQC is required to promote "the establishment and promotion of quality assurance mechanisms and processes"

and to ensure the "effective functioning, co-ordination and management of the H.E.Q.A.". Such a statement implies that institutions must meet the standards set by relevant quality assurance (QA) agencies. Qualification frameworks also serve as another standard for assessment.

4.3. Equity, Inclusion, and Access

To achieve equity, inclusion, and access across higher education and beyond, an analysis of the contexts in which diverse forms of inclusion occur is required (M. Campbell & PhD Hellenbrand, 2002). Attention is drawn to differences in:

- gender (including intersex persons);
- race (ethnicity);
- specialisation (field, genre, scientific disciplines, etc.); and
- resources and infrastructure.

Access to resources required to enable performance (financial, human, vocational, infrastructural, equipment, consumables, etc.) is critical to the performance of any activity. Attention to access is therefore deserved wherever systems of equity, inclusion, and access are at stake.

Becoming a registered student at a university does not guarantee full participation in the university's activities (Mercer-Mapstone, 2019). Various

programs worldwide address this issue through student participation, spanning curriculum design, co-teaching, and mentoring.

Findings indicate that educational contexts are by no means uniform with respect to gender equity, non-discrimination against visible minorities, inclusive specialisation, or equitable access to infrastructure.

Another dimension concerns access to a higher education. Contemporary legislation designed to ensure that members of disadvantaged and intersectionally disadvantaged categories receive appropriate assistance does not always work effectively. Available assistance mechanisms may fail to reach those in need.

5. Case Studies of Successful Boundary-Breaking Initiatives

Colleges or schools organised around cross-cutting themes encourage boundary-spanning conversations through flexible curricula that bridge established disciplines. The College of Earth, Ocean, and Atmospheric Sciences at Oregon State University offers undergraduate degrees in environmental science and marine biology; a graduate degree in water resources policy and management; and interdisciplinary minors in geospatial analysis, marine studies, and natural resources. The Institute for Creative Enterprise and the Institute for Critical Technology and Media at Wright State University are transdisciplinary design laboratories that foster collaborations among art, engineering, business, and other disciplines. The Faculty of Social Sciences at Simon Fraser University encourages transdisciplinary teaching and interaction among members of the divisions of Arts and Social Sciences, Business, Communications, Education, and Environment; the School of Engineering Science; and the School of Interactive Arts and Technology (Dillon et al., 2014).

5.1. Cross-Disciplinary Colleges and Schools

Higher education institutions are increasingly recognising that complex 21st-century problems can be addressed only through the integration of diverse knowledge domains. The need for a cross-disciplinary approach to human activity is central to binding together diverse faculties, schools, and institutes that have evolved on university campuses since the 1960s (Farrow McNeely et al., 2018). Fully integrated cross-disciplinary colleges and schools represent a structural model for extending the disciplinary integration anticipated by the broader concept of faculty fusion.

The urgency of addressing societal problems through cross-disciplinary collaboration is highlighted by the proliferation of systemic risks (A. Best et al., 2007). Problems such as sustainability, food security, climate change, threats to democracy, infectious disease, and social isolation have multiple interrelated dimensions, leading to widespread demands for a shared vocabulary for cross-disciplinary discourse across the humanities, arts, and sciences.

5.2. Transdisciplinary Research Centres

Higher education institutions are increasingly facing demand for research that is not only cross-, multi-, or inter-disciplinary, but transdisciplinary—science that proceeds beyond integration across disciplines and paradigms, such as ecology, to address issues such as climate change, food security, and public health (Reckinger & Wille, 2018). Transdisciplinary centres resemble and have arisen alongside other boundary-crossing units, but tend to focus most heavily on research. Redirecting resources toward societal engagement rather than traditional outlets is strongly at odds with the broader shifts in public goods provision evident in many higher education systems; units defined by this commitment will therefore require distinctly different operating models. Transdisciplinary centres constitute a relatively new and consequently less well-understood variant of boundary-crossing initiatives.

Several institutions are fusing faculties in pursuit of a new paradigm for publicly engaged higher education, one that supports scholarship while also addressing the complex problems of contemporary society. Such efforts exhibit a striking diversity in conceptualisation, organisation, and operation. Institutions that initiate boundary-crossing initiatives or re-examine existing ones would benefit from a detailed analysis of these cases. In higher education, the transdisciplinary label denotes a focus on societal engagement and the integration of research, education, and outreach. It applies to centres, institutes, and units constituted explicitly with this emphasis. Institutions also employ the term in connection with university-wide strategies, engagements alongside centres inextricably linked with research, and cross-college efforts to address public issues without explicit transdisciplinary framing; these initiatives are not considered transdisciplinary under this understanding.

Transdisciplinarity is distinguished from both interdisciplinarity and postdisciplinarity. Whereas interdisciplinarity either integrates

knowledge across independent disciplines or generates new disciplines, postdisciplinarity neither requires integration across established disciplines nor generates new ones. Transdisciplinary research engages non-academic societal actors in the processes of co-creating knowledge and co-defining questions; in contrast, participation in interdisciplinary research does not necessarily prevent public access through systematic outreach, and being primarily concerned with societal issues, postdisciplinary research is pursued in tandem with, rather than after, discipline-related activities (Kokt et al., 2012).

Shifts in both state governance and university behaviour inform contemporary efforts to foster transdisciplinary practices. Governance has moved from vertically organised, principle-based, and law-influenced to horizontally oriented, rule-based, and indicator-driven; institutional agents have shifted from central authorities to academic actors, and encouragement has changed from encouragement to expectation. Institutional behaviour patterns are evolving from simple, stationary models to complex, off-centre modes that facilitate continuous adaptation, from credit-providing and ideology-directing to capability-enhancing and opportunity-enabling,

and from preparing inputs and controlling outputs under prescriptive regulations to promoting synergy and enriching enabling environments that adhere to suggestive frameworks.

5.3. Integrated Degree Programs

Capstone projects at the close of the program can address real-world problems that involve collaboration across disciplines. In contrast, research student supervision can involve input from complementary fields from the adviser. Such arrangements provide a framework that helps institutions to escape the straitjacket of concentration-based degrees. Students receive a conventional qualification in their discipline while pursuing a secondary interest tailored to their requirements. Faculty involvement in discussions on curricular integration is often critical to success. An integrated degree program in Australia between an engineering faculty and the medical school of a University includes both executive roles for the research bureau with the greatest public policy impact and joint delivery of teaching modules in executive education. Programs of this type can at least partially overcome the difficulties posed by differing credit point systems by operating on a common core.

Integrated degree programs connect two or more distinct qualification pathways,

allowing students to pursue a secondary focus aligned with their interests or career aspirations. Capstone projects undertaken at the close of the program can emphasise real-world problem-solving and may involve collaboration with an external partner. In research training, co-supervision with an adviser offering input from a complementary field enriches the student's experience. Such arrangements can help institutions escape the straitjacket of concentration-based degrees. Students receive a conventional qualification in one discipline while pursuing a secondary interest tailored to their individual needs. Faculty involvement in discussions on curricular integration can be critical for success. At one Australian university, an integrated engineering degree program draws on the medical school's executive education resources. Integration is advanced by joint delivery of teaching modules, and the resulting Bureau for Executive Education and Research has become the university's hub for research with public policy impact.

6. Impacts on Knowledge Creation and Societal Benefit

The historical approach to knowledge generation and dissemination has predominantly adhered to rigid disciplinary frameworks. Only through interdisciplinary collaboration can humanity address the multifaceted challenges of planetary health, which frequently intersect multiple topics and no longer respect established disciplinary boundaries (Gilbertson et al., 2019). During the last decade, local sustainability initiatives have gained acceptance and can serve as models for advancing knowledge, progress, and impact on broader planetary health challenges (Farrow McNeely et al., 2018). Therefore, institutions of higher education should augment outreach and knowledge co-creation by promoting cross-fertilisation of research and teaching among faculties.

Interdisciplinary research spanning multiple topic areas is critical to preserving the benefits of scientific inquiry while exploring creative approaches to advancing performance culture in universities (Lynton, 1991). In the context of research and outreach fusion, the humanities and social sciences should aim for synthesis across research traditions, continue to cultivate diverse clusters of imaginative and talent development, and establish more integrated means of educating, evaluating, and rewarding interdisciplinary scholarship. Organising research to empower communities to address complex challenges is most effective when it fosters creativity, explores local knowledge and culture,

and attends to the broader societal and ecological implications of creative activity.

Widespread enthusiasm exists for the preservation and elevation of STEM through integration and outreach, yet a similar effort is neither sought nor considered important in the arts. Consequently, many institutions have begun establishing supportive cross-institutional centres to advance the integration of scientific and artistic research. Such complementary disciplines seek larger-scale opportunities for providing students with imaginative tools while sustaining institutional and community engagement. By assembling multiple disciplinary perspectives, collective efforts can reinvent appointments and elevate the stature and impact of artistic research across institutions.

6.1. Advancements in Theory and Method

Methodological innovations and theoretical syntheses exhibited by boundary-breaking initiatives deepen insights into complex societal challenges and foster the co-creation of actionable solutions.

More and more institutions of higher education are undertaking bold, boundary-breaking initiatives that combine two or more faculties, colleges, schools, programmes, or disciplines around a common focus on knowledge creation and its rich potential for social good, sustainability, and development in economic and social sectors. This strategic integration enhances our understanding of the linkages among plants, animals, and people, facilitating the co-design of sustainable agro-, forestry-, and aquaculture systems and bringing together the humanities, arts, social sciences, science, and engineering to use modern materials and processes in creative ways to produce new knowledge and develop critical design and making skills with respect to urban, architectural and landscape challenges. The fusion of health, management, engineering, and biotechnology is investigating these underlying phenomena and designing new measurement techniques, methods, and systems for life sciences data to enable knowledge transfer from fundamental ideas and discoveries to the potential viability of therapeutics. Winning proposals for entirely novel designs and materials, located at the interface of chemistry, biology and engineering, create functional systems to make chemicals, fuels and drugs inside metabolic networks, which further create new tools to explore fundamental biochemistry.

Such initiatives yield significant advancements in method, theory, and design. Methodological innovation encompasses holistic modelling of agricultural systems; consideration of complex sociotechnical systems across urban design and architecture; design exploration through performance and real-time simulation; modelling of spatial and temporal dependencies in life-science data; and the design of living cells with user-programmable functionality. Theoretical advances unite modelling of socioeconomic, infrastructural, ecological, and climate-change dynamics within a single framework; connect acoustic qualities, cultural contexts, and expressive intentions in urban and sound-art composition; and integrate uncertainty and spatial structure into life-science models. By transcending disciplinary boundaries—often facilitating novel combinations of methods, legislations, theories, and formulations—the fusion of faculties directly enriches knowledge production and catalyses more impactful science (Godemann, 2006; Boehm, 2014).

6.2. Innovation, Industry Engagement, and Policy Implications

Recent years have witnessed an extraordinary increase in the exodus of knowledge and technology from universities to industry (Turner et al., 2004). This phenomenon is partly explained—as though not fully—as a shift from knowledge transfer to knowledge co-creation, prompting researchers to adopt entrepreneurial roles similar to those of businesses, venture capitalists, or financial institutions. Universities must reconsider how they interact with society. Commercial enterprises have long applied co-creation—staff members with diverse expertise working together on customer-specific solutions—with outstanding results and considerable returns; universities should closely monitor these developments to avoid simply replicating other organisations' methods (Schwengber ten Caten et al., 2019).

Much knowledge is co-created from sources originating on various local, national, and global platforms. Rapidly changing environments have led to a deep, ever-growing interdependence among governments, the public sector, businesses, and society at large. Knowledge and technology transfer from universities to industry has never been so crucial, but to effectively co-create knowledge, defensive intellectual property rights should generally be avoided (Kokt et al., 2012); an active interplay of knowledge originating in a specific discipline, learned knowledge, and further-acquired knowledge is essential. Many academic institutions

adhere to established government guidelines for research and, in general, do not integrate innovation or entrepreneurship into their educational programs. In addition, certain faculties, in response to governmental or independent requests to foster an enhanced entrepreneurial spirit, emphasise entrepreneurship and, in limited areas, develop innovation and innovation-acquisition capabilities.

7. Methodological Considerations for Future Research

Future investigations into the fusion of faculties should adopt a metrics-based approach to assess their impacts and sustainability by establishing evaluative frameworks that trace outcomes longitudinally. Consideration of relevant ethical and epistemological issues is also pivotal, especially regarding the norms, potential biases, and representations associated with multi- or transdisciplinary activities.

Designing appropriate metrics to assess both the activities associated with various initiatives and their attendant impacts is a significant challenge. Candidates for such metrics must demonstrate applicability across institutions, datasets, and time frames and should support longitudinal analyses covering the trends and trajectories of observables. Potential

indicators include the volume and nature of funding secured to stimulate further transdisciplinary engagement; the establishment and maintenance of collaborative platforms that attract scholarly participation through co-funding; and the sophistication and diversification of co-production or partnership models emerging across research portfolios. Drawing on Dillon, A, and Gardner, K, it is important to examine how institutional frameworks, such as policies and incentives, interact with disciplinary configurations to enable or constrain the fusion of faculties and the generation of social and economic returns, thereby (Dillon et al., 2014) ; (K Gardner, 2013). Institutional size, scale, and status may also influence the opportunities, prospects, and conditions for boundary-breaking initiatives. Realisation of the full scholarly, environmental, economic, and societal evaluative spectrum associated with diverse formations, configurations, and subsequent outcomes of faculty fusions requires longitudinal analysis that spans both the ephemeral and the enduring. Monitoring the durability of enrolments, funding, outputs, impacts on cosmopolitism, and intermediate characteristics across the spectrum from event to embedding may enable planning for sustainability. Longitudinal studies that track both the ingress and egress, collective occupancy periods, and

transformational trajectories of postdoctoral scholars may provide insights into initial boundaries and opportunities for transitional programming.

Discernment of epistemological and ethical issues related to disciplines and, consequently, to the fusion of faculties is essential. Constructing maps of disciplinary distributions, distributions of transformation leading to administrative and/or taxonomic alterations, the presence or absence of junior supervisory involvement, levels of funding, modalities of instantiation other than core faculty appointments, patterns of postdoctoral engagement, and topological transition tracking facilitate an understanding of the motives and opportunities for institutional engagement concerning the original scholarly trajectories that interact with other disciplines. Addressing questions of bias, imbalance, and representation is equally vital across disciplines and interdisciplinary domains, in the material and online accessibility of knowledge, in the postdoctoral and early-career researcher occupancy across these domains, and in the scope of knowledge production. Providing epistemologically sensitive, coherent, and relevant frameworks to facilitate transdisciplinarity and the application of pre-existing disciplinary knowledge domains, rather than relying exclusively on undeveloped knowledge, further cultivates scholarly engagement.

7.1. Metrics and Evaluation

Metrics for a comparative investigation of the impact of cross-faculty, interdisciplinary, and transdisciplinary initiatives on knowledge creation and societal benefit are necessarily diverse and multifaceted, recognising the variation in their type, context, and delivery. Indicators related to changes in instructional collaboration, program design, learning activities, and assessment strategies provide a basis for evaluating educational transformation and the development of skills, capabilities, knowledge, values, and behaviours consistent with the demands of contemporary society. Data sources supporting network analysis of collaboration patterns within and between faculties include institutional research and management systems, repository records, and funder data on projects involving external partners. Cross-faculty research degree programs offer a natural opportunity to track student experiences and outcomes longitudinally.

A recurrent ambition of these initiatives is to enhance the relevance of knowledge creation to real-world challenges, typically operationalised through the

transfer of knowledge and technology to industry and business sectors. Mapping commercialisation processes and outcomes, tracking the number of patents awarded, and correlating changes in teaching delivery with evidence of enhanced entrepreneurial activity and entrepreneurship education fostered by new centres, institutes, or schools provide indicators for evaluating progress in these areas. Further investigation of support for applied research collaborations with industry partners, captured in external funding data, offers insights into knowledge transfer and societal relevance. In addition to patent-filing activity, measures of the broader impact of research on the Australian public in areas such as health, bioethics, housing, migration, and urban infrastructure are emerging through the Australian Research Council's engagement and impact assessment process.

7.2. Longitudinal Studies and Sustainability

Ensuring the long-term sustainability of initiatives beyond their initial funding phase remains a pressing challenge (Činčera et al., 2019). Longitudinal studies on transdisciplinary co-laboratories, transdisciplinarity in general, integrated research programs in the context of artificial intelligence and policy-related research, collaborative development of university strategic plans, and the integration of studies on sustainability in higher education, among others, indicate that the fusion of faculties is notoriously challenging to embed in the university institutional fabric. Such studies reveal a potential decline of interest and financial support, as well as a risk of re-establishing earlier disciplinary divides after a considerable number of years, which often leads to reduced effectiveness for addressing complex societal challenges. Longitudinal tracking of initiatives over time reveals the integration of cross-faculty collaboration and policy into the development of university strategic plans. It also highlights the role of policy networks in orchestrating networked innovation and transdisciplinary metropolitan university–business collaboration.

Tracking developments over time can identify patterns that enhance the institutional embedding and durability of initiatives. It assesses the extent to which formal measures foster the integration of transdisciplinary teams and agenda-setting work. Initiatives can be examined for their capacity to develop durable programs that harmonise previously disparate disciplines and fields. Data on university revenues and expenditures, disaggregated by faculties and research institutes, assess the

trajectory of co-funding for integrated programs across separate institutional accounts. Mapping research proposals to funding schemes and initiatives linked to transdisciplinary research allows visibility into the collaboration dimensions of the university's agenda.

7.3. Ethical and Epistemological Considerations

Many of the a priori ethical dilemmas associated with interdisciplinary research at the cross-over points of two or more disciplines are the same as those in research strictly within a single discipline. For example, isolation from input from others and possibly from competing viewpoints may exacerbate rather than mitigate the risk of bias, and an idea that has successfully passed through the 'gate-keeping' stages of peer review in one discipline may not have comparable standing in another. The question arises of how to 'present' collaborative work, not only to convey collaborative involvement but also to represent each of the constituent disciplines fairly. There is then the matter of selecting personnel to fairly reflect the desired level of commitment across the relevant disciplines.

Some disciplines now deploy a repertoire of approaches as a more or less standard provision, yet few colleagues are likely to be 'trained' in all available approaches

bridging disciplines. Consequently, the broader practices associated with interdisciplinary work become even more difficult to convey, and the disciplines at the interface are further clouded by the aforementioned pressures. In disciplines with strong, replicated track records of collaboration and parallel practices well established across many branches, even questions of selection and presentation arise. This situation, in turn, leads to related matters of modelling and documentation. In charting the collaborative interweavings among disciplines with different levels of commitment, while still addressing a topic of interest to all parties, a further decision warrants attention. Interdisciplinary work requires a methodology, even if the methodologies of the separate components remain fixed.

Ultimately, access to well-functioning, model-established disciplinary communities characterises many established institutions. Paradoxically, some intervention in one discipline may help bring a second discipline on board. However, an exclusively newly formed branch may sustain the purposive link. However, it is unlikely to persist: rare, well-evaluated forward and backward transfers may succeed across branches, just as guidance across even related sub-disciplines is often essential. Restricted institutional choice constitutes an

additional source of difficulty. Interest and commitment may yet be difficult to gauge accurately, and group membership is therefore not always communicated widely or sufficiently. Furthermore, even where disciplines are known to justify involvement, documentation, and monitoring remain voluminous and arduous; modelled findings can also be constrained.

8. Policy Implications and Strategic Recommendations

Collaborative leadership must emerge both within and beyond the academic sphere, placing academic matters at the centre, and embracing fluid, flexible, ever-evolving curricular responses attuned to specific student, institutional, and community needs. Engaging all participants in building and maintaining the vision, planning together, earning their trust, and overcoming resistance to change is essential for differentiating institutions, colleges, and schools in the public mind. This form of coordination stresses the need to consider students, the major stakeholders in higher education, and university purposes and aspirations as the heart of decision-making. It reinforces the distribution of responsibilities among participants without displacing the accountability of those designated to coordinate efforts, guiding knowledge, information, and authority toward the attainment of

institutional missions, while allowing each area to develop varying degrees of autonomy and leadership across a variety of programs. Partnering for academic and administrative collaboration affords opportunities to integrate research, curricular offerings, and service initiatives; to move beyond conventional educational silos; to strengthen ties to the community and broader civic engagement; and to connect the campus mission to regional issues. Such collaboration facilitates work on some traditional disciplines that others may consider branches or specialities, while bringing issues related to personal environments, safety and health, sustainable buildings, and social structures and behaviours into perspectives that increasingly fit within the foundations of higher education. Beyond the conventional, it addresses a broad spectrum of community, security, and sustainability concerns that remain central to the constitution and shaping of society. (Mae Abdallah, 2011)

9. Conclusion

The present investigation aims to elucidate the different organisational structures and governance mechanisms that higher education institutions adopt to transcend disciplinary boundaries. Various broader terms are used to describe these phenomena: interdisciplinary, multidisciplinary,

cross-disciplinary, transdisciplinary, multi-paradigmatic, paradigm integration, post-disciplinarity, boundary work, bridging, crossing, blending, annexing, escaping, fusion of faculties, infusion, and direct dialogue, among others. Interdisciplinarity is the mixing of disciplines or the blending of perspectives.

In many studies, including this one, the focus is on additional mechanisms prevalent in contemporary higher education systems that both encourage and assist cross- and transdisciplinarity. A critical analysis of established programmes across institutions worldwide has already provided a wealth of insights into organisational structures. However, there remains a substantial knowledge gap regarding the governance frameworks that guide these configurations. This aspect demands further exploration.

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