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# Building Capacity in IR and Decision Support: Alliances for Higher Education Research (HER) and Institutional Research (IR) for the 2019 AU Network Proceedings Book

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**Building Capacity in IR and Decision Support:  
Alliances for Higher Education Research (HER) and Institutional Research (IR)  
For The 2019 AU Network Proceedings Book**

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## **1 Introduction**

Current issues in higher education across the world require higher education leaders to thoughtfully make data-informed decisions. Lowered government funding support, greater reliance on tuition fees, increasingly diverse student populations, and greater accountability prompt the need for accurate, contextualized data. These issues prompt higher education researchers to further examine the effect of changing dynamics within colleges and universities on student and organizational success. As such, higher education scholars apply their skill and deep knowledge of theory of policy application to the study of campus issues. In addition, current matters call on the work of data analysts and strategic planners, many of whom serve broadly as institutional research practitioners as they play a pivotal role in providing data that has been transformed into useful information for decision making. Especially as higher education institutions (HEIs) move further into the use of Big Data, predictive analytics and other related methods that use large volumes of data, analysts and decision makers will need to consider how to use data and information for effective decision support.

As a professional field, institutional research is taking a stronger hold in HEIs around the world. Currently in Austria and other parts of EU, the issues, activities, and strategic directions for institutional research are somewhat different than those used in traditional academically-focused education research, however, there are also some commonalities. As higher education continues to move into the next decade, it seems important that HEI practitioners and policymakers consider strategies that will blend actions from both institutional research and higher education research to ensure strong and effective decision support and student success.

## **2 Institutional Research and Higher Education Research Defined**

2.1 **Institutional Research (IR)** has been a distinct profession in U.S. higher education for over 50 years. Saupe (1990) defined IR as “the sum of all activities directed at empirically describing the full spectrum of functions (educational, administrative, and support) at a college or university, which are used for the purposes of institutional planning, policy development, and decision making” (p.1). Fincher (1985) described IR as a specialized administrative function and fittingly described its practitioners as organisational intelligence specialists. In considering the existing literature on the foundations and practice of this decision support function, Fincher described the IR office

as the ‘engine room’ of the university; developers of policy-related research and research-led policy; and catalysts for institutional change. Fincher’s work prompted Terenzini (1993; 2013) to consider the forms of personal and professional competence, institutional understanding, and knowledge needed for effective IR practice. IR practitioners may be called or tasked with duties related to data collection, analysis, and/or reporting. They may do broader academic planning and strategy, or quality assurance. IR leaders are most effective when they are part of senior level discussions on data and its interpretations within the context of the particular institutional setting. Calderon (2011) remarks that some IR practitioners are playing an active and visionary role in developing and assessing strategy and long-term positions for institutions as well as state and national higher education systems. This level of knowledge is acquired through experience in the field, keeping abreast of the latest scholarly literature, contemplation of the literature, and collaboration with peers on how IR professionals can provide effective decision support at their institution. To assist in an increased understanding of IR, The Association for Institutional Research (AIR) offers succinct information on the roles and functions of IR, see <https://www.airweb.org/ir-data-professional-overview/duties-and-functions-of-institutional-research>.

The depth and breadth of IR and decision support and the manner in which it is carried out depends on the environment within the institution and within the boundaries where institutions operate (Webber & Calderon, 2015). Across the world, government legislation and funding seek to improve individuals and society as a whole. In many educational systems, and increasingly so in many parts of the world, the central role of IR has been cemented through these legislated requirements for institutions to provide information on the evidence of effectiveness. Ultimately, the purpose, functions, activities, services, roles, and mission of IR is determined by institutional decision makers. IR is what serves best or fits the purpose of institutions and this is what then defines IR within an institution. There is not an easy way to describe what the typical IR office generally does, nor what it is expected to perform. The extent of an IR unit’s responsibilities is based on the institution’s organisational structure and to whom the IR office reports. However, acknowledging the variation, there is a set of tasks, roles, and functions that come together to define institutional research in today’s higher education.

**2.1 Higher education research (HER)**, on the other hand, is generally viewed as objective, research that examines particular topics related to higher education populations or organisations, typically intended for a community of peer scholars who also study the subject. Teichler (2014) comments that HER examines the views, the activities, and the work context of those who study current activities policies, and anticipate the future roles of actions. This may include analysis of activities or policies enacted for a single institution, but more likely it is the study of higher education issues for a larger set of institutions within a region, nation, or perhaps trends across the world. With its greater focus on theoretical concepts and relationships, HER research does not necessarily draw practical solutions and compared to the US and Canada, many European policy makers believe that HER should be performed in academic departments and institutes, not in the administration (Borden & Webber, 2015). As an interdisciplinary field, higher education scholars often find guidance from theories that have been developed in other academic

disciplines such as economics, organizational management, and personal growth and psychosocial change that occurs over time. With strong theoretical frames to guide, traditional empirical HER offers results from rigorous positivist and postpositivist designs, however, HER scholars are more recently acknowledging the value of qualitative, constructivist studies that offer insights into today's college students, including marginalized populations. Regardless of the research method, HER scholars remain dedicated to uncovering new insights about the higher education community or the organization. Since HER activities may be supported by externally-funded grants, they are motivated firstly by knowledge inquiry and less by institutional problem-solving. HER may also serve decision making and resource allocation purposes, but more often focuses on policy at higher levels, including regional and national governments.

Although tasks consistent with IR have been carried out in European institutions for many years, formal IR was first (more formally) established in the U.S., and in some global regions just now forming. In the 1980s, as some EU national governments granted higher education institutions more autonomy in exchange for forms of accountability (Neave & van Vught, 1991), institutions were prompted to use their internal capacity to generate information and data in order to satisfy the government's demands to oversee the institutions. Over the past few decades, government oversight has continued and higher education researchers have sought to inform local and national policymakers related to higher education issues. Professional associations may also serve to facilitate discussion of higher education policy. As the leading educational research association in EU, and although its focus is much more strongly related to traditional HER, The European Higher Education Society (EAIR) plays an important role in HE research policy and practice in Europe and beyond (see <http://www.eairweb.org>).

Indeed, both types of research ultimately serve improvement purposes: for IR the target of improvement is a specific institution's programs and overall effectiveness; for HER, the target of improvement is perceived to be higher education as a sector in its service to the education and development needs of the populace (Borden & Webber, 2015). Because today's decisions require broad and deep data and decisions, working among colleagues is important. Borden and Kezar (2012) argued that decision making in higher education is a collaborative organisational process and not as much an activity among just a few managers as implied through earlier definitions and perspectives of institutional research. As a result, they suggest the need to shift "the purpose of IR from one that informs decisions to one that contributed to organisational learning and thereby facilitates improvements in organisational effectiveness" (p. 86). This shift and challenges in today's higher education further reinforces the benefits of alliance between HER and IR. Perhaps a visual way to view the alliance is seen in Figure 1.



Figure 1  
Model for Collaboration Between HER and IR

As shown in the figure, HER and IR professionals engage in a variety of tasks, some may fall in a category of routine collection, analysis, and reporting of data, many of which might be done more frequently or using less overall personnel time or resources. Aligning with Terenzini's tiers of intelligence (2013), additional tasks and time commitment may be allocated to management of data and/or collaboration with others to more deeply study, analyse, or publish research findings. While tasks related to collection, analysis, and management are important to advance informed decision making, more senior level IR and HER staff may invest some or a greater proportion of their time contributing to strategies that ensure appropriate use and analysis of data as well as planning and policy development. In this proposed framework, IR and HER officials may take on various tasks depending on individual skill level and/or as assigned within the unit's organization. Importantly, however, there are many opportunities for further involvement in IR and decision support through individual contribution or collaboration among IR and HER staff.

### 3 Characteristics of Effective Institutional Research

Along with an understanding of HER, effective IR practitioners possess a number of skills and understandings on higher education strategy, management, and organizational roles. These competencies include a knowledge of basic statistics, educational research methods, strategies and practices for program evaluation, principles of quality assurance, survey research design and implementation, key roles and responsibilities for higher education leaders, and familiarity with the roles of key external stakeholders. In line with Terenzini's Tiers of Organisational Intelligence (2013), these Tier 1 (technical and analytic) and Tier 2 (issues) skills are best implemented when the IR practitioner executes Tier 3 (organisational) intelligence that includes a deep knowledge of higher education that enables one to effectively communicate how the information is situated within the specific context at hand.

Other scholars have contributed to our understanding of IR. Volkwein (1999; 2008) defined IR on the basis of its managerial purpose, identifying four functions or faces of IR. Largely as information analyst, Volkwein views the IR practitioner also as a policy analyst, 'spin doctor', scholar/researcher. These last three functions are deemed

secondary to the information analyst function. However, Huisman (2013) poses the question whether this is problematic for IR in that it appears as being inward-looking.

Somewhat in line with Volkwein's roles, Maasen (1986) identified IR on the basis of the services it provides, including data collection on institutional performance; data collection on the institutional environment; analysis and interpretation of data collected, and transformation of the data into information for decision support in planning and management. Similarly, Delaney (2009) defines IR on the basis of services it provides, with practitioners engaged as higher education industry knowledge analysts, and functioning as knowledge brokers. Collectively, these scholars acknowledge that IR officials are first and foremost focused on completing tasks that serve to better inform institution leaders about one or more aspect of the institution, typically an issue that requires additional information that can help senior leaders determine a solution to ensure smooth operations within the institution.

Adding to the ideas put forth by Terenzini (2013), Huisman (2013) and others scholars noted, I would add that today's effective IR leaders must be well-versed with new data analytic techniques (such as predictive analytics and quasi-experimental methods) and be integral in the institution's development of a broad and collaborative data governance plan. To ensure success, data management, security, and distribution of select information should not remain solely in the IR unit. However, IR leaders must remain central in institution-wide discussions about all aspects of student, staff, and institution-level data. Lead IR practitioners understand data definitions and nuances of data within a specific context, thus providing valuable information to senior decision makers. Key discussions about data access, governance, security, and privacy are all critical and can benefit from knowledgeable IR leader involvement and prompt the importance of ensuring that IR leaders remain central in data governance models. For more information, Glasgal and Nestor (2020) detail the role for IR in data governance.

A number of recent discussions debate the value and need for 'democratization' of data (e.g., Swing & Ross, 2016). As HEIs have enabled active data users in a wide range of departments across campus, these authors advocate for a more decentralized structure for IR would allow decision makers across campus to develop their own data reports, In many cases, such a decentralized structure may allow for the development of additional data repositories that would be in contrast to a single source model. Although Swing and Ross (2016) argue that such expansion would not diminish the perceived value nor strength of the IR office, it seems likely that such a federated network model, unless structured correctly, has the potential for increasing the misuse and misunderstanding of data and consequently, a lower perceived value of IR. It seems likely to me that misunderstandings that come from an unregulated dissemination of data to untrained users unfamiliar with data definitions will lower the perceived value of the IR unit, leading to its reduced stature and staff size. While a broader set of institutional data users is appropriate, a reasonable approach requires thorough training of new users prior to data release to ensure knowledge of data definitions, context for specific elements that may be unique to one's environment, and knowledge of principles related to good

graphic and visual design that ensure against misinterpretation. More information on the need for and value of good graphic design can be found in Webber and Morn (2020).

#### **4 Drivers in the Evolution of Institutional Research**

When one considers the state of higher education today, it is likely that data-informed decision making will remain a priority in HEIs (Lane & Finsel, 2014; Klemençiq, 2016), and individuals who develop detailed and contextualized information will be valued. The growth of IR across many parts of the world is observed clearly in the increased number of international affiliate groups to AIR. Due to insightful leaders and/or governments that see the value of higher education for more citizens, IR is expanding at a rapid pace in some global regions, while less so in others, but nevertheless growing and securing a place of value in HEI decision making. Mathies (2018) identifies three key elements that have contributed to the evolution of IR: 1) major technological advances; 2) increased demands for accountability; and 3) substantive changes in university administration. Many changes have and will continue to occur related to technology changes, including the way institution officials capture, integrate, analyze, and report data, the push to integrate cloud, web-based servers, and large-scale databases and increased external stakeholder interest in accountability and quality assurance.

In particular, technology changes will ensure that data analytics will receive greater attention among HEI leaders. Following the lead of activities in business and industry over the past two+ decades as well as a small number of innovative scholars and HEIs over the past 5-10 years (e.g., Daniel, 2017; Lane & Finsel, 2014; Khalil & Ebner, 2015; Viberg, Hatakka, Balter & Mavroudi, 2018) more faculty and staff will likely be involved in the use of larger volumes of data (often at the level of Big Data) and relevant analytic and visualization techniques that assist in student and institution success. Increases in technology, lower costs for data storage and computing power have enabled IR and other data analysts to use (or learn to use) data from multiple sources, organized following strong and effective data governance principles, perhaps using complex algorithms and predictive analytic techniques. Primary areas for stronger data analytic techniques include enrollment management, student recruitment, classroom learning, and student advising, as well as the use of analytics to manage facilities maintenance and to analyze many operations within institutional finance both of which are important to ensure good return on investment (ROI).

Overall, the growing needs related to new technology and increased institutional accountability have prompted a growth in HEI administrative staff to help complete day-to-day reports and long-term planning activities. While the timing of the growth of IR may have coincided with massification in some regions, it has benefitted IR by increasing its visibility, size of staff, and professionalization. Combined with the growth in student enrollments, IR officials will remain busy with the increasing number of tasks being added to their work responsibilities.

Due in part to the addition of new staff as well as new work tasks such as data analytics may likely require some additional training or professional development by IR and other data analysts. Regional and local conferences such as the AU Network, EAIR,

and organizations such as the Association for Institutional Research (AIR) are offering opportunities for colleagues to discuss and learn as well as adding new training sessions (webinars face-to-face training) to enhance skills in advanced analytics techniques, understanding of artificial intelligence, machine learning, and ways in which these techniques can be used in higher education.

## 5 Building Capacity in Institutional Research

As the demand for data-informed decisions grows, IR practitioners will be seen as valued colleagues by senior administrative leaders. Today's technology and strategies for the use of data for student and institutional success will require IR professionals with advanced skills. That means we that must increase the number of staff and knowledge set of IR practitioners. Following the works of scholars such as Cooper (2007), Dill (2000), Lancrin (2004), and Marginson (2006), building capacity in IR requires leaders to consider the drivers that shape higher education today. A growing discussion in higher education management, particularly in EU, is that of HEI's Third Mission (Pausits, 2016), and here too, IR can contribute to this discussion. Individuals engaged in capacity building, particularly at the organisational level, must be aware of and strategic in their interactions with individuals within and across organisational departments. As well, specifics of the environment, relationships, and indirect authorities across organisational units can contribute to the assignment of responsibilities and the effectiveness of collaborative work.

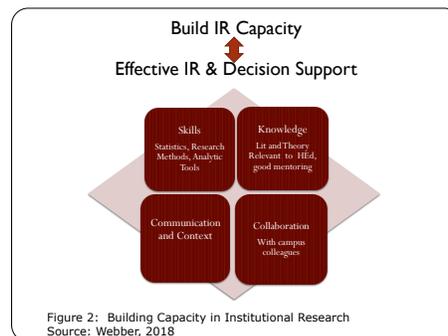
Today's IR practitioners face a tall order; they must have technical and analytic skills, they must understand the foundations and practice of higher education, and they must be able to seamlessly use their knowledge and skills to provide accurate and useful information for decision making. IR directors must balance proactive and reactive reporting and information needs, and articulate it in a way that can be heard by the stakeholder. As Bramblett and Broderick (2018) point out, building capacity in IR includes a deep understanding of the organisational structure, how information flows, and how one's specific college or university is interconnected with other units on campus. This requires IR practitioners with deep and wide skills sets as well as knowledge of the institution's plan for short-term and a vision for long-term goals. Such skills may require additional professional development, particularly related to techniques for completing data analytics as well as knowledge of management principles that facilitate the institution-wide transition to successful data-informed decision making broadly across the campus.

Professional development for individuals who perform IR tasks is a primary way to build capacity. Through annual face-to-face conferences such as AU Network, EAIR, and seminars and online workshops, IR practitioners have access to formal and informal opportunities to increase their knowledge and skills. For a broader reach, AIR offers a professional development activity, the *Holistic Approach to IR* (<http://www.airweb.org/EducationAndEvents/OnlineLearning/Pages/A-Holistic-Approach.aspx>). This activity may be valuable to professionals who are new to IR, this

program is offered online as well as in a hybrid version of face-to-face and online work to ensure transmission of important information for those new to IR and an opportunity to build collegial relationships with others.

Capacity building is also about mature growth. Better institutional research and decision support will benefit from growth in practitioner knowledge, skills, and experience, and broader capacity development ideally takes place within a framework of three interrelated levels - individual, organisational, and environmental, all of which facilitate growth and change. In some regions or countries of the globe, IR and decision support are well-known concepts to higher education leaders. However, in some regions, capacity building will be easier once senior leaders are well informed about the practices broadly included in IR and the value that IR can bring to decision making.

Shown in Figure 2, growing IR will lead to more effective IR and better decision support. In my view, building the capacity of IR requires four competencies: 1) skills in statistics, research methods, and tools; 2) knowledge of higher education literature and theory; 3) good communication and a robust understanding of the context; and 4) a willingness as well as organisational commitment to collaboration with other campus colleagues who are also vital to effective decision support. Collecting and increasing these capacities may not happen overnight, but prudent goal-setting can ensure their achievement, and the outcome can be better decision making within the institution.



## 6 Broadening and Strengthening the Practice of IR In Austria and Beyond

The desire for more effective decision making by HEI leaders in Austria offers a unique opportunity for institutional research to grow and become a more substantial contributor to an institution's decision support. Strengthening the IR function will require senior leader support and resources to add staff members as well as ensure professional development training. Stronger alliances with HER researchers is also beneficial. Perhaps it is even possible to have some HE faculty who serve part of their time in an IR capacity. HE scholars can use a high blend of literature and theory-based knowledge to examine institutional questions that are of practical importance. This might result in a mix of action-based and policy-affected scholarly research that investigate relevant issues that have an impact on institutions.

In some regions of the world, IR is already more closely aligned to institutional policy and program development. In Australia for example, Calderon (2015) observed a growing trend for IR practitioners to undertake studies within and across industry sectors that may require specialized knowledge residing outside IR offices. This requires that IR practitioners be aware of the wider spectrum of institutional activities, strategic intent, and policy implications within the education industry and across industries over multiple jurisdictions. In other regions, traditional models of university governance are progressively being transformed so that HEIs are becoming not only strategic actors competing in decentralized markets comparable to private companies (Slaughter & Rhoades 2006; Cantwell & Kauppinen 2014), but are also knowledge production actors supporting public policy goals of government, with an increased public accountability and scrutiny, despite with shrinking government financial support (Whitley & Gläser 2014). These reforms in HE activities are planned, implemented, and assessed and these changes invariably have an impact on the roles, functions, service and purpose of IR. IR practitioners are not only required to adapt and embrace new forms of work, but need to respond by broadening and deepening their skills so they can be effective in the emerging workplace models resulting out of ongoing reforms taking place worldwide.

When integrated within the HEI setting, IR practitioners operate across several functional units and perform various roles within the university, including admissions, marketing, quality, assessment, and strategic planning. This means that IR professionals must be knowledgeable of institution functions and practices broadly. According to Whitchurch (2013), the increasing interdisciplinary nature of higher education, influences and implementations of technology, manager and learner preferences for team work, and ideological commitments to widening participation in higher education prompt more diffuse roles. These conditions may create ‘blended’ knowledges, contextual cross-boundary knowledge that transforms *information* into *knowledge*. ‘Blended’ relationships emphasizes partnerships and credibility is based on social and professional capital. It requires that individuals to know the campus and higher education issues well, to think about their role more broadly, and to develop new language to communicate with partners. For the IR professional, this less-constricted sense of identity (or redefined identity!) can be advantageous, as it can be an incentive for innovative work practices and for pursuing exploratory and speculative research to advance the institution’s mission and play an active role in shaping HE policy generally.

The opportunity to broaden and strengthen IR in the future will be especially critical as higher education moves into a new era of Big Data and advanced data analytics. While many private businesses have been using these strategies and techniques for the past decade or so, the higher education sector is now embracing them in a larger way. Knowledge of analytics, how to capture, store, and use the data, how to keep it secure, and how to use it properly for student and institution success will be required from many in HEIs, and IR professionals can be instrumental in guiding an institution’s broader use of Big Data and advanced analytics.

Today's advanced educational technologies include learning management systems (LMS), early alert or early warning advising systems (EWS), dashboards, and other tools that provide information on student application and enrolment, the management of student performance, course retention, and degree progress. Big Data and other data analytics are also being used to monitor heating and cooling of campus buildings, to examine frequency and length of library and recreation facility use, and to identify the most time-efficient bus routes. Advanced analyses, both traditional inferential analyses based on previous or current data, as well as predictive modeling and machine learning techniques, enable analysts to discern patterns that can be combined with contextual judgement to inform decisions. I believe data analytics will become a larger part of an institution's decision fabric that requires strategic planning from a broad institutional perspective. It will require the allocation of resources that reflect its growing importance in support of the institution's mission and vision for the future.

In the era of advanced data analytics, effective data-informed decision making will require three main conditions: people, technology, as well as process and culture. Along with institutional leaders who play a critical role in providing resources and the vision for analytics implementation, institutions will need more data engineers, data architects, data scientists, visualisation analysts, and analytics translators. HEIs will also need advanced technology and relevant software, a strong data governance system that includes policies on user access and standard data definitions and specifications. Because adherence to Government Data Protections Regulation (GDPR) and other privacy policies are necessary, transparency and security should be integral to learning analytics technology rather than afterthoughts (Reidenberg & Schaub, 2018). Successful data-informed decision making will require institution leaders to modify their business processes and intentionally build an analytics culture. Leaders will need vision about how and where to embed learning analytics into specific as well as institution-wide decision making. At this time, there is some HER-level literature that has examined some initial attempts at learning analytics (e.g., Khalil & Ebner, 2016; Viberg et al., 2018), but much more research is needed. Due to space constraints here, more discussion about data analytics in higher education can be found in the upcoming book by Webber and Zheng (2020).

## References

- Association for Institutional Research. (2017). Duties and functions of institutional research. Resource document. AIR.  
[https://www.airweb.org/Resources/Documents/AIR-Duties-and-Functions-of\\_IR.pdf](https://www.airweb.org/Resources/Documents/AIR-Duties-and-Functions-of_IR.pdf). Accessed 12 May 2017.
- Birnbaum, R. (1988). *How colleges work*. San Francisco, CA: Jossey Bass.
- Borden, V. M. H., & Kezar, A. (2012). Institutional research and collaborative organizational learning. In R. D. Howard, G. W. McLaughlin, W. E. Knight, & Associates (Eds.), *The handbook of institutional research* (pp. 86-106). San Francisco, CA: Jossey-Bass.

- Borden, V. M. H. & Webber, K. L. (2015). Institution and educational research in higher education: Common origins, diverging practices. In K. L. Webber & A. J. Calderon (Eds.), *Institutional research and planning in higher education: Global themes and context*, (pp. 16-27). New York, NY: Routledge.
- Botha, J., & Hunter-Husselman, M. (2016). The management and use of research-related information by a selection of research-intensive universities in South Africa. In J. Botha & N. Muller (Eds.), *Institutional research in South Africa: Global contexts and themes* (pp. 299-318). Stellenbosch, SA: Sun Press.
- Bramblett, S., & Broderick, M. (2018). Professional development for the institutional research (IR) professional: Institutional research and decision support in the United States and Canada. In K.L. Webber & A. J. Calderon (Eds.), *Institutional research and planning in higher education: Global themes and context*, (pp.135-154). New York, NY: Routledge/Taylor Francis Press.
- Calderon, A.J. (2015). Institutional research, planning, and decision support in higher education today. In Webber, K. & A. Calderon (Ed.) *Institutional research and planning: Global contexts and themes*, (pp. 186-196), New York: Routledge.
- Calderon, A. (2012). Massification continues to transform higher education. Resource document. *University World News*, Issue No. 237. <http://www.universityworldnews.com/article.php?story=20120831155341147>. Accessed 2 Feb 2017.
- Cooper, P. (2007). Building capacity for public health. *Journal of the Royal Society for the Promotion of Health*, 127(6), 257-258.
- Daniel, B.K. (Ed.) (2017). *Big Data and learning analytics in higher education: Current theory and practice*. Switzerland, Springer Press, DOI 10.1007/978-3-319-06520-5
- Delaney, A. M. (2009), Institutional researchers' expanding roles: Policy, planning, program evaluation, assessment, and new research methodologies. In C. Leimer (Ed.) *Imagining the future of institutional research, New Directions for Institutional Research*, no. 143, (pp. 29–41) San Francisco: Jossey Bass.
- Dill, D. D. (2000). Capacity building as an instrument of institutional reform: Improving the quality of higher education through academic audits in the UK, New Zealand, Sweden, and Hong Kong. *Journal of Comparative Policy Analysis: Research and Practice*, 2(2), 211-234.
- Dressel, P. L. (1981). The shaping of institutional research and planning, *Research in Higher Education*, 14(3), 229–258.
- Fincher, C. (1985). The art and science of institutional research. In M. W. Peterson & M. Corcoran (Eds.), *Institutional research in transition* (pp. 17–37). New Directions for Institutional Research, No. 46. San Francisco: Jossey-Bass.
- Glasgal, R. & Nestor, V. (2020). Data governance, data stewardship, and the building of an analytics organizational culture. In K. Webber & H. Zheng (Eds.). *Big Data on campus: Data-informed decision making in higher education*. Baltimore: Johns Hopkins University Press.
- Huisman, J. (2013, July). Institutional Research in Higher Education: Speaking truth to power ... and whether it would be wise to do that on your own. Keynote address, *Sixth conference U.K. and Ireland Institutional Research*. Birmingham, England.

- Khalil, M., & Ebner, M. (2015). Learning Analytics: Principles and Constraints.” In *Proceedings of World Conference on Educational Multimedia, Hypermedia and Telecommunications 2015*, pp. 1326-1336. Chesapeake, VA: AACE.
- Khalil, M., & Ebner, M. (2016). “What is learning analytics all about? A survey of different methods used in 2013-2015.” Conference Proceedings of the 8<sup>th</sup> e-Learning Excellence Conference, Dubai, UAE.
- Klemenčič, M. (2016). The role of institutional research positioning universities: Practices in Central and Eastern European countries. In R. Pritchard, A. Pausits, & J. Williams (Eds.) *Positioning higher education institutions: From here to there*, (pp. 3-18), Rotterdam, Sense Publishers.
- Klemenčič, M. & Brennan, J. (2013). Institutional research in a European context: A forward look, *European Journal of Higher Education*, 3(3), 265–279.
- Lane, J. E., & Finsel. B. (2014). Fostering Smarter Colleges and Universities: Data, Big Data, and Analytics. In *Building a Smarter University: Big Data, Innovation, and Analytics*, 3-27, J. E. Lane (Ed.). Albany: State University of New York Press.
- Lancrin, S. V. (2004, October). Building capacity through cross border tertiary education. In *UNESCO/OECD Australia forum on trade in educational services* (pp. 11-12). Sydney.
- Maasen, P. (1986, September). Institutional research and organizational adaptation. Paper presented at the eighth European Association for Institutional Research, Loughborough, England.
- Maasen, P. & Sharma, R. (1985). *What is institutional research? A primer on institutional research in Australasia*. Melbourne, AU: Australasian Association for Institutional Research.
- Marginson, S. (2006). Dynamics of national and global competition in higher education. *Higher Education*, 52(1), 1-39.
- Mathies, C. (2018). Ethical use of data. In C. Mathies & C. Ferland (Eds.) *IR in the Digital Era. New Directions for Institutional Research*, (pp. 98-114), Boston: Wiley.
- Neave, G. & van Vught, F. (eds.) (1991). *Prometheus Bound: The Changing Relationship between Government and Higher Education in Western Europe*. Oxford: Pergamon Press.
- Pausits, A. (2016). The knowledge society and diversification of higher education: From the social contract to the mission of universities. In In: Curaj A., Matei L., Pricopie R., Salmi J., Scott P. (Eds) *The European higher education area.*, (pp. 267-284).Springer, Cham.
- Pfeffer, J. & Salancik. G. (1978). *The external control of organizations*. New York: Harper and Row.
- Reidenberg, J.R. & Schaub, F. (2018). Achieving Big Data privacy in education. *Theory and Research in Education* 16(3) 1-7, DOI:10.1177/147787851885308.
- Saupe, J. (1990). *The functions of institutional research*, 2<sup>nd</sup> ed., Tallahassee, FL: The Association for Institutional Research.
- Slaughter, S. & Rhoades, G. (2004). *Academic capitalism and the new economy: Markets, state, and higher education*. Baltimore, MD: Johns Hopkins University Press.

- Teichler, U. (2014). Opportunities and problems of comparative higher education research: The daily life of research. *Higher Education*, 67(4), 393-408.
- Terenzini, P. T. (1993). On the nature of institutional research and the knowledge and skills it requires. *Research in Higher Education*, 34, 1–10.
- Terenzini, P. T. (2013). On the nature of institutional research. Revisited: Plus ça change, *Research in Higher Education*, 54(2), 137-148.
- Viberg, O., Hatakka, M., Balter, O. & Mavroudi, A. (2018). The current landscape of learning analytics in higher education. *Computers in Human Behavior*, 89, 98-110. <https://doi.org/10.1016/j.chb.2018.07.027>
- Volkwein, J. F. (2008). *The foundations and evolution of institutional research*. In D. G. Terkla, (Ed.). *Institutional research: More than just data. New Directions for Higher Education*, No.141, (pp. 5–20). San Francisco: Jossey Bass/Wiley.
- Volkwein, J. F. (1999), The four faces of institutional research. In J.F. Volkwein (Ed.) *IR: What is it all about? New Directions for Institutional Research*, volume 104, (pp. 9–19), San Francisco: Jossey Bass.
- Webber, K.L. (2015). Eyes to the future. In K. L. Webber & A. Calderon (Eds.), *Institutional research and planning in higher education: Global themes and contexts* (pp. 229-237). New York: Routledge.
- Webber, K. L., & Calderon, A. J. (2015). *Institutional research and planning in higher education: Global contexts and themes*. New York: Routledge.
- Webber, K.L. & Morn, J. (2020). Limitations in data analytics: Potential misuse and misunderstanding in data reports and visualizations. In K. Webber & H. Zheng (Eds.). *Big Data on campus: Data-informed decision making in higher education*. Baltimore, MD; Johns Hopkins University Press.
- Webber, K.L. & Zheng, H. (2020). *Big Data on campus: Data-informed decision making in higher education*. Baltimore, MD; Johns Hopkins University Press.
- Whitchurch, C. (2013). *Reconstructing identities in higher education: the rise of third space professionals*. Abingdon, Routledge.
- Whitley, R., & Gläser, J. (2014). The impact of institutional reforms on the nature of universities as organizations. *Research in the Sociology of Organizations*, 42, 19-49. doi:10.1108/S0733-558X20140000042000.