Broadening the perspective on radiography education

W.A.S. Cox, R. Strudwick, F. Bello, P. Cavenagh
University of Portsmouth, United Kingdom

Abstract

The environment within which diagnostic radiographers work is in a state of continual flux. Some of this change originates from the rapidly evolving technologies which radiographers utilise. In 1990, Stephen Barley hypothesised that changing technology affects roles, relationships and networks within organisations. In this article we suggest that changing technologies have had an important impact on the role of the radiographer. Furthermore, that this change results in shifting skill requirements for practicing diagnostic radiographers. Therefore, it is important that newly qualified staff are adequately prepared by their academic institutions to engage with these changing roles. Given the current political and economic context, we suggest that there are key management principles which ought to be considered as candidates for integration into modern radiography curricula. We identify three key subject areas where this integration might be successfully achieved: interprofessional learning modules; imaging technology modules; and the research project.

Barley's theory

In 1990, Steven Barley, the renowned organisational theorist, wrote 'The Alignment of Technology and Structure through Roles and Networks'.[1] This seminal work reflected on how advances in technology impacted on the roles, relationships and networks of individuals working within organisations. Barley[1] noted that in 'no other area of medicine have computers triggered a more thorough metamorphosis than in radiology' (p.71). Perhaps as a result of this, Barley chose to undertake his study within two X-ray departments. In that study, Barley described the modes via which medical imaging technology impacted on the relational and non-relational roles, relationships and networks of specific healthcare professionals. He argued that new technologies modify non-relational aspects of roles within organisations. This change, in turn, shapes internal role relationships resulting in the transformation of the social networks that constitute organizational structures. In particular, he focused on the impact of the many recent and rapid technological advances in medical imaging techniques and equipment on the roles and role relationships of both radiographers and radiologists.[1]

In considering roles, Barley[1] examined Nadal's definition of relational roles as those roles which "cannot be played without an alter ego" (p.68) and non-relational roles as those which required that a person "need only engage in that bundle of behaviours deemed by members of a culture to be characteristic of that role" (p.68). He argued that roles should be considered rather as more complex constructs consisting of both relational and non-relational elements. He further argued that few tasks are genuinely independent. Therefore, task-based roles are likely to influence with whom individuals interact as well

as how they relate to others. As a result of this, any technological change which affects the non-relational role of an individual will have an impact on their relational roles within the organisation. Essentially, the introduction of novel technologies changes the way an individual works, whom else they work with, and how they interact with those others. This school of thought, which has become widely known as the socio-technical approach, has greatly impacted on both practice[2] and education[3] in recent years.

A changing environment

Barley's work was influenced by issues that were pertinent in the context of the time at which he was writing. The work helped to create an awareness of how the introduction of new technology impacts on social systems. Since the time of Barley's paper, much has changed in the healthcare environment. Hayre *et al.*[4] note that while these changes bring opportunities, they are not without challenges for both professionals and patients. Technology has once again advanced considerably and continues to do so. Examples include the rise of fusion based imaging, the increased use of direct digital radiographic systems, and the availability of imaging for diagnosing at the point of treatment, as well as for viewing at the point of acquisition. Contemporaneously, the roles of healthcare professionals have undergone a process of progressive evolution. The advent of ultrasound and the proliferation of sonographers are one example of technology changing existing roles. Similarly, the increasing demand for computed tomography (CT) head examinations out of hours to meet the dictates of stroke pathways and trauma protocols is changing the way that radiographers are working with this modality. The move towards the 7 day working week within the National Health Service (NHS) may have implications for both staffing levels and role extension. The institution of the four tier system and the creation of posts for the advanced practitioner and the consultant radiographer, whose scope includes duties traditionally reserved for their medical colleagues, have signalled a paradigm shift in relational roles within the healthcare system,[5] which brings with it opportunities for both development and deskilling[6] of respective professional groups involved. These role changes have occurred in line with, and through the vehicle of, initiatives such as 'skills mix'.[7] Looking back some 30 years in this paper we question whether it is time to consider what these technological and role related changes mean for the modern curriculum of radiography students.

An evolving syllabus

In general, radiographer education has extended the curriculum over time to reflect many of the social changes afforded by introducing new technologies as described in socio-technical theory. The varied demographic of radiography undergraduates means that these changes have both pedagogical and andragogical implications. Advances in the sociological side of the profession are addressed in a plethora of courses on inter-professional education and communication and care skills. Additionally, student radiographers are now provided with modules designed to reflect advances in technologies such as CT, magnetic resonance imaging (MRI) and positron emission tomography (PET), as well as the changing educational benchmarks set by external bodies such as the Society & College of Radiographers (SCoR), the Quality Assurance Agency (QAA) & the Health and Care Professions Council (HCPC). But, what of other competencies that will be required of the radiographers of the future, as healthcare moves further into an era where it is seen as necessary to be accountable, efficient and effective as well as being clinically and socially adept? Modules which equip student radiographers for these roles are often either minimalized or overlooked in curriculum designs. The future will require all healthcare personnel to be aware of the concept of 'value' in their practice.[8] Given the rapidity with which technology is advancing in medical imaging, and with the 'Any Qualified Provider' (AQP) agenda contributing to the movement of the healthcare service towards a business model,[9] should radiography students be made aware of management principles early in their careers; should radiography graduates now possess at least a basic understanding of economic, financial and accounting principles?

There are several business syllabus topics which are particularly pertinent in this context. These include:

- Economics, accounting & finance
- Strategy
- Organisational behaviour
- Human resource management

- Innovation & entrepreneurship
- Marketing

In this article, therefore, we examine the applicability of these topics to radiography education by defining them and providing tangible examples of their practical relevance. Thereafter, we begin to highlight areas where they might be integrated effectively into existing curricula.

The potential for adoption

Economics, accounting & finance

While economic value represents only one facet of the broader perspective of assessing value in diagnostic imaging and diagnostic radiological images, in the modern context, radiography students will need an awareness of the costs of healthcare and why decisions are made about relevant diagnostic tests and treatment. In order for students to be aware of the economics of the healthcare system, they need to be aware of, and able to apply, practises such as cost/benefit analyses to healthcare provision. The utilisation of cost/benefit analyses and their integration into healthcare operational planning is increasingly representing the norm in organisational approaches.[10, 11] Radiographers need to consider these principles when comparing imaging modalities, e.g. MRI, CT and ultrasound (US). In the future, imaging modalities will be compared not only on the basis of their sensitivity, specificity & accuracy, but also in terms of their financial implications and costs, considerations which currently may not be explicitly considered in all undergraduate radiography degree programmes. Alongside this, students will require an awareness of how healthcare systems are evaluated and monitored and where economic considerations play a role in order that they are able to effectively contribute to the attainment of organisational goals.

Strategy

Cost/benefit analysis offers a window via which students may begin to consider other strategic factors. The development of an awareness of the strategic viewpoint is necessary in order to understand where the radiographer and the imaging department fit into the wider organisational context. Students will require an understanding of how issues such as risk, competition, and planning are managed within healthcare and what their role is in this. It will also be necessary for students to be prepared to adequately assess the utility of developing technologies through applying strategic tools such as the Strengths Weaknesses Opportunities Threats (S.W.O.T.) analysis. This technique is important when considering the utility, implementation and usage of not only basic IT systems,[12] but increasingly of cloud–based systems.[13] It is imperative that students are sensible of the need to be forward looking and possess a strategic vision regarding where their profession is moving in the context of these rapidly changing technologies.

Organisational behaviour

It has been noted that the concepts of quality in healthcare and considerations of organisational change are closely linked.[14] Students need to be aware of how organisations operate and how this impacts on professional culture and interprofessional communication. This will assist graduates in integrating into their employing organisations, promoting understanding of the processes involved in decision making and how this impacts on them and their work. Other concepts which will become more important for practicing professionals to be aware of include: diversity in the workplace managerial processes and organisational effectiveness. Awareness of these concepts will assist graduates in contributing effectively to organisations.

Human resource management

The HCPC requirement of radiographers to participate in the instruction of students and the hierarchical nature of the NHS workforce mean that graduates may well be managing others early on in their careers.[15] Therefore, they will need to be equipped with the skills to teach, assess and manage others. This may encompass an awareness of the importance of changes in employment legislation and the rights and obligations of employers and employees. It is also important that students be made aware of both facilitators and constraints associated with employment law. Beyond this, a basic understanding of human resource management theory will assist graduates in understanding key principles of organisational competitive advantage through human resource.

Innovation & Entrepreneurship

Throughout their degree programmes, students are encouraged to be innovative and to consider service improvement. Eventually, this will apply not only to radiographic technique, but also to the innovative use of technology in order to, *inter alia,* identify areas for role expansion and technical optimisation. If the AQP agenda continues, radiographers will need to be entrepreneurs in the future. They may be required to seek out opportunities for future services, role development and, eventually, income stream generation. It is therefore important that they are aware of considerations such as development and marketing.

Marketing

Although there has been acknowledgement of the need for public services such as healthcare to engage with effective marketing strategies for some time,[16, 17] more recently, and as the AQP agenda gathers momentum, graduates may become involved with bidding for services or even needing to market themselves in an increasingly competitive marketplace. Therefore, it is important that they are introduced to elementary marketing principles, such as positioning and utility, before they enter into this environment, if they are to compete effectively.

Opportunities for integration

Having identified relevant business syllabus topics for adoption, we now consider four areas of existing radiography curricula where these topics might be integrated, if they are not currently provided.

Interprofessional learning

All undergraduate radiography courses now provide some level of interprofessional learning. It would be appropriate to integrate instruction on both strategy and organisational behaviour into these modules since both of these topics will affect all health and social care professions and should be understood within that context. Beyond working together with other professionals to improve the care of service users, it is essential to foster a perspective which is broader than that of the graduate's own profession if they are to complete meaningful S.W.O.T. analyses or understand the factors which influence organisational behaviour and success.

Organizational and regulatory aspects of healthcare organizations

Existing courses frequently include instruction in this area. Such modules are ideally suited for the targeted integration of instruction in economics, accounting and finance, as well as human resource management and marketing. The concept and applicability of cost/benefit analyses, for example, may be introduced alongside other factors when comparing the respective attributes of differing imaging modalities. Such modules also offer an opportunity to introduce the necessity for teaching and assessing others, and measuring their performance against existing benchmarks.

Imaging technologies and modalities

Modules on technology and imaging modalities are standard in radiography curricula. Due to the topics and concepts covered in these modules, they are excellent candidates for the integration of learning in innovation and entrepreneurship. The concept of S.W.O.T. analyses, for example, could be taught in an applied manner for assessing innovations in imaging technologies.

The research project

Whether it takes the form of a small-scale study, an audit, or a literature review, the final year project provides students with an excellent opportunity to examine an aspect of service improvement and gain insight into the theory and practice of a number of the topics discussed above. The integration and application of business principles into the rationale and discussion of a project may be invaluable for promoting students' understanding of their fundamental importance, as well as contributing depth and currency to the work itself.

The road ahead

In conclusion, we have considered the importance of several key business principles to radiographic practice in the context of Barley's theory. It is essential that students leave their respective educational institutions as well prepared for the practice environment as is possible. Whilst it is impossible to predict and pre-empt future changes in technologies and accordingly instruct students in every aspect of their potential future roles, it is possible to give them the theoretical underpinning and skills which will enable them to assess, internalise and adapt to these changes themselves. The current advances in technologies, combined with a volatile economic climate, mean that now is the time to expand our understanding of the core skills which graduating radiography students will require in order to adequately prepare them for the future.

References

1. Barley, S.R. (1990) The alignment of technology and structure through roles and networks, *Administrative science quarterly* 35 (1), pp.61-103

2. Kerr, M. (2002) A qualitative study of shift handover practice and function from a socio-technical perspective, *Journal of Advanced Nursing* 37 (2), pp.125-134

3. Choi, S.Y., Kang, Y.S. & Lee, H. (2008) The effects of socio-technical enablers on knowledge sharing: an exploratory examination, *Journal of Information Science*, 34 (5) pp.1-10

4. Kelly, J., Piper, K. & Nightingale, J. (2008) Factors influencing the development and implementation of advanced and consultant radiographer practice – A review of the literature, Radiography, 14(1), pp.71-78

5. Hayre, C.M., Blackman, S. & Eyden, A. (2016) Do general radiographic examinations resemble a person-centred environment? *Radiography*, 22(4), ppe245-e251

6. Braverman, H. (1974). *Labor and Monopoly Capital: The Degradation of Work in the Twentieth Century*. New York: Monthly Review Press

7. Woodford, A.J. (2006) An investigation of the impact of a four-tier profession on the practice of radiography – A literature review, *Radiography*, 12(4), pp318-326

8. Porter, M. (2010) What is Value in health Care? *The New England Journal of Medicine*, 363:2477-2481

9. Scheaff, R., Chambers, N., Charles, N., Exworth, M., Mahon, A., Byng, R., Mannion, R. (2013) How managed a market? Modes of commissioning in England and Germany, *BMC Health Services Research*, 13(Suppl 1):S8

10. Moreno, E., Giron, F.J, Vasquez-Polo, F.J., Negrin, M.A. (2009) Optimal healthcare decisions: Comparing medical treatments on a cost-effectiveness basis, *European Journal of Operational Research*, 204, pp.180-187

11. Neumann, P.J., Palmer, J.A., Daniels, N., Quigley, K., Gold, M.R., Chao, S. (2008) A Strategic Plan for Integrating Cost-Effectiveness analysis Into the US Healthcare System, *The American Journal of Managed Care*, 14(4), pp.185-188

12. Helms, M.M., Moore, R., & Ahmadi, M. (2008) Information Technology (IT) and the Healthcare Industry: A SWOT Analysis, *International Journal of Healthcare Information Systems & Informatics*, 3(1), pp.75-92

13. Masrom, M. & Rahimli, A. (2015) Cloud Computing Adoption in the Healthcare Sector: A SWOT Analysis, *Asian Social Science*, 11(10), pp.12-18

14. Davies, H.T.O. & Nutley, S.M. (2000) Organisational culture and Quality of Health Care, *Quality in Health Care*, 9(2), pp.111-119

15. Health & Care Professions Council (2013) Standards for Proficiency: Radiographers. London: Health & Care Professions Council

16. Laing, A. (2003) Marketing in the Public Sector: Towards a typology of public services, *Marketing Theory*, 3(4), pp.427-445

17. Hodgkinson, I. (2012) Are generic strategies 'fit for purpose' in a public service context? *Public Policy and Administration*, 28(1), pp.90-111