Lost in Translation? Negotiating Technological Innovation in Healthcare

Sub-theme 28: Translating Discourses: Text, Change and Organization

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Introduction

Technological innovation in healthcare is growing at a rapid pace. Developments in genetics, stem cell research, bioinformatics, imaging and screening techniques have broadened out the arena of health technology. These developments in sophisticated technology, it is suggested, have the potential to revolutionize the practices of medicine and healthcare by providing more proactive and powerful tools for the diagnosis, treatment, and prevention of illness and disease (Liddell et al, 2008; Webster, 2002). In support of such claims, available research findings suggest that the adoption of new innovative health technologies (IHTs) can result in reducing healthcare costs, increasing productivity, healthcare effectiveness, and improving the patient's experience of care by better management of chronic diseases (Liddell et al, 2008; Healthcare Industries Task Force, 2004).

At the same time, new innovative health technologies present many challenges. Evidence indicates that patient safety and proven clinical effectiveness are insufficient

to ensure the adoption and implementation of new clinical technologies. The prevailing organizational and policy context is crucially important as this may present barriers which slow or even prevent uptake (Lehoux 2006). In recent years there has been a continuing debate around issues of clinical resistance, organizational/clinical restructuring, procurement and commissioning, public trust, and, more widely, around the ethical and social implications of techno-scientific innovations in medicine and health (Williams and Dickinson, 2008; Webster, 2006; Ferlie et al., 2005). Moreover, cost-effectiveness evidence is now required to inform decisions about the funding and procurement of new healthcare services and technologies (Fitzgerald et al., 2002). Overall, the value of the innovation has to be clearly evident to a number of different stakeholders if technologies are to be embedded into actual work practices. These potential barriers have given rise to questions related to the diffusion and adoption of emerging medical and healthcare innovations.

This paper examines the dynamics and complexity of innovation adoption processes in the context of a rapidly changing healthcare policy landscape. Drawing upon the inherently socially negotiated character of meaning, this paper illustrates the ambivalent nature of technological innovation by examining the complex ongoing interplay of heterogeneous discourses in shaping the adoption of innovative health technologies (Law, 1987, 1994). Drawing upon Rye and Kimberly (2007) adoption is here understood as a distinct organizational process related to an organization's potential interest in implementing a technological innovation. In so doing, this paper draws on the findings of a three year research project which examines the adoption of innovative clinical technologies in the UK NHS. In particular, we explore the nature, role and dynamics of heterogeneous discourses (technological, managerial/professional, clinical), in shaping the adoption of a retinal imaging technology in a UK hospital Trust. In this regard, we contribute to the development of alternative ways of describing, analysing, and theorizing the process of technological innovation in healthcare.

The Context of Study

In the UK, promoting the adoption of technological innovation in healthcare systems is a key element of government policy to increase productivity and clinical service

quality within the NHS (Robert et al., 2010; Liddell et al., 2008; Greenhalgh et al., 2005). However, it is generally acknowledged that technology adoption within the NHS is slow and uncoordinated (Darzi, 2008; Cooksey, 2006). The Healthcare Industries Task Force (2004), for example, described the NHS as 'a late and slow adopter of technology' and addressed the need for a coherent approach to the adoption of technological innovation. In response, to this and other challenges, a number of policies have been developed aiming to facilitate innovation by emphasising both the importance of technology and the role that technology can play in improving patient safety, health outcomes and increasing productivity (Department of Health, 2007). For example, current policy initiatives towards evidence-based medicine (EBM) aim to promote the adoption of innovations of proven value in all areas of clinical practice. Furthermore, various national bodies and agencies with a technology remit have been established, such as the NHS National Innovation Centre (NIC) and the NHS Technology Adoption Centre (NTAC) whose aims include encouraging, promoting and accelerating the uptake of new technological innovations (Liddell et al, 2008).

Technological Innovation in Healthcare

A large and growing body of literature has explored the role and nature of technological innovation in healthcare (Robert et al., 2010; Faulkner, 2009; Williams and Dickinson, 2008; Rye and Kimberly 2007; Webster, 2006; Ferlie et al., 2005; Greenhalgh et al., 2005; 2004; Fleuren, Wiefferink, and Paulussen, 2004; Walker, 2003; Wolfe, 1994; Scott 1990; Greer 1977). Theory addressing the diffusion and adoption of technological innovation has traditionally focused on the techno-economic properties and features of innovation (i.e. technological capabilities, size or features of the organizational structure, readiness, resources etc) as well as on the social context of the innovation process by exploring the contingencies and socio-political particularities surrounding innovation (i.e. individual traits and organizational factors such as individual leadership, culture etc). Although these studies have contributed towards the wider analysis of the innovation process, often implicitly and/or explicitly they assume a clear demarcation between functional forms of analysis or techno-centric perspectives advanced, for example, by economics, and engineering accounts and more critical or sociological approaches which emphasize

the political nature and the social ramifications of the innovation process. Drawing upon a distinct theoretical and methodological foundation each approach offers contrasting explanations about the nature, role and influence of technological innovation.

Techno-centric or deterministic studies view the diffusion and adoption of technological innovation as the outcome of a rational-linear process (i.e. an essentially autonomous) with inevitable determining impacts or effects on the organizations/socio-economic life and society as a whole (MacKenzie, 1999; MacKenzie and Wajcman, 1985; Williams and Edge, 1996). Traditional 'linear models'/staged or sequential models have tended to emphasise the 'structural properties' of innovation where organizational level variables (i.e. structural determinants such as size or features of the organizational structure) and technological capabilities and capacities are considered as the main enabler of change (Williams et al., 2005). At the centre of these explanations lies a 'casual technicism' (Grint and Woolgar, 1997), a reductionist approach to innovation which assumes an unilinear technological impact. As such, they assume that technology is an exogenous and relatively autonomous driver of social and organisational change with predetermined impacts on various social and organisational outcomes, such as governance structures, work routines, productivity and performance (Edge, 1988).

Viewing technological innovation as a rational-linear process has been the subject of many criticisms (Williams and Edge, 1996; McLoughlin, 1999). Overall, it has been argued that the causal simplicity offered by such a perspective fails to acknowledge the complexity of institutional, political, and social factors that shape the diffusion and adoption of innovation. Alternatives to techno-centric, linear models emphasize the profound uncertainties surrounding technological innovation, by highlighting the non-rational nature of decision-making and the political context within which innovations become adopted and used (i.e. non-structural determinants such as the micro-politics of the organisational setting, interests, prevalent rhetorics, fads, individual leadership, culture) (Grint and Woolgar, 1997; Neyland and Woolgar, 2002). These approaches are more participative in nature highlighting the complexity, political context, broader social network and the social ramifications of the innovation process (Dawson and Buchanan, 2005; Knights and Murray, 1994). This position

implies that the trajectory of innovation does not reflect its technical advantage in terms of any inherent capabilities and characteristics, but rather the social processes which establish consensus around its superiority (McLoughlin, 1999).

While sympathetic to the critical view of innovation, it is suggested that, empirical evidence on the diffusion/adoption of innovation has generally been reduced to a single level of analysis (functional vs sociological explanations); and has also assumed simple causal relationships between variables (Anderson et al., 2004) when it seems that technological innovation is subject to powerful, albeit complex discourses. As such they have failed to address the important interactions between different levels of analysis (for example addressing the impacts of both techno-economic properties and organizational context on innovation adoptions within strategic decision-making contexts) and thus failed to take into account the interrelationship between these two positions.

Innovation as Discourse

Alignment of heterogeneous discourses is a key element of successful innovation neglected by simple linear models of technological imperative and market demand (Williams et al., 2005; Suchman, 2000; Latour, 1999; Law, 1992; Callon, 1986). In so doing, it examines the complexity surrounding technological innovation by exploring the nature, role and dynamics of heterogeneous discourses in the framing and constitution of adoption pathways. For the purposes of this paper, discourse is conceived as the performative act that systematically produces and structures a particular order/representation of reality (Berger and Luckman, 1966; Gergen, 1999). as systems of representation, discourses regulate/structure the meanings which can and cannot be produced through both language and practice. In so doing, they provide the context in which phenomena become negotiated and enacted. The notion of discourse refers not just to linguistic forms of communication and representation but to a variety of textual forms such as narratives, documents, artwork, symbols, technologies, architectures and other artefacts (e.g. Fairclough, 1995; Grant et al., 1998; Taylor et al., 1996; Wood and Kroger, 2000). By the same token technological innovation is framed as a social system/process that encompasses a broad range of

textual forms/phenomena including material objects, knowledge practices, learning, interests, power, politics, leadership and conflict resolution (Bowker and Star, 1999).

Drawing upon these ideas, the diffusion and adoption of technological innovation is considered as the outcome of the ongoing negotiation between sociomaterial discourses in practice (Latour, 2005, 1993). Rather than residing within the techno-economic features of innovation or the micro-politics of the organization and the commitments of the various actors involved, the sustained acceptability and adoption of technological innovation rests on a series of alliances or associations across sociomaterial discourses that must be assembled together in the social network (Latour 1993; Law, 1987, 1994; Callon, 1986). The idea of alignment and 'negotiation' of interests stresses therefore technological innovation as a contingent process. Challenging traditional 'linear' models this paper suggests that sociomaterial alliances or associations represent a defining characteristic in the innovation process by enabling or constraining particular adoption pathways. As different 'relevant social groups' have a diverse set of interests, stability and social order rests crucially on the ability to translate, that is, the re-presentation/re-framing of meaning, ideas or practices in action (Callon, 1991). Accordingly, when a form of consensus around multiple meanings emerges, an innovation may become stabilized (Pinch and Bijker, 1984). When this occurs, the outcome is intended to be an occasion where the discourse is not just technological but involves the consideration of the ethical, organizational, professional, social and cultural aspects of the innovation. Thus, success always depends upon overcoming resistance and enrolling allies to what can be an ever-shifting support network of sociomaterial relations and discourses.

This position does not presuppose a prior distinction between the social and the material domains of discourse. In other words, the social and material domains are not considered *a priori* as self-contained entities that influence each other the adoption of innovation (Orlikowski and Scott 2008). Instead, discursive and material relations are entwined in a mutual shaping process (McLoughlin and Dawson, 2003; Pickering 1995). The mutual shaping perspective provides the basis for reconsidering the supposed ontological separation among the social and the material, the subject and the object influencing the trajectory of technological innovation (Barad, 2007). At the same time, this perspective supports the interpretive flexibility of technological

innovation beyond the design phase, and the scope for innovation through re-interpretation and re-configuration to support and challenge vested interests, identities, and power positions (McLoughlin, 1999). These wider cultures of ambiguity are of central importance in understanding the context within which innovative health technologies are deployed.

Methodology

Drawing on ethnographic fieldwork, this paper explores the ongoing negotiation and translation of heterogeneous discourses between different groups and individuals in an attempt to introduce a new retinal imaging technology in a UK hospital Trust. This paper is based on fieldwork that was conducted during 2009-2010. Detailed data collection was conducted through semi-structured interviews (14 in total) supplemented by participant observation, and review of the Trust's internal documents and policies related to technology adoption. Participants included clinicians, chief executives, procurement managers and commissioners, to project managers, technology providers and other specialists. All interviews lasted between 60-90 minutes and were digitally recorded and transcribed. For confidentiality reasons all parties collaborating in the research have been anonymised.

Background

The technologies under study were identified by the NHS National Technology Adoption Centre (NTAC) in its 2008 National Call for projects. NTAC aims to increase the adoption of technological innovation within the NHS; in particular technology that has been indentified as having the potential to deliver significant benefits to the NHS system and particularly to its patients. It functions as an advisory body on policy to the UK government, promoting and supporting the uptake of technologies which have been successfully selected as standard of care in its Technology Implementation Projects. NTAC is also responsible for creating meeting places for actors involved in the innovation process. The overall aim is the production of guidelines (How-to-Why-to Guides) detailing how a technological innovation can be successfully implemented and the benefits to both patients and organisations that

can be achieved. The Department of Health and the National Institute of Health Research are the most important contributors to its budget.

In 2008 NTAC announced a call for technologies for its Technology Implementation Projects and after closer assessment a new ultra wide-field retinal imaging technology (henceforth, WRIT) was selected. The application was submitted by Ophtamol Plc for its technology which was perceived unique in providing a wide digital image of the retina. The technology provides, in less than a second, a 200 degree digital image of the retina by means of a scanning laser system placed close to the eye. The digital image is expected to highlight pathology on the retina to the quality required by an ophthalmologist to make a diagnosis. Following the selection of technology, NTAC initiated a Call for Trusts to invite applications from Trusts to work on implementation projects related to the adoption of WRIT. The research site (henceforth, NHS Foundation Trust) made a successful application to NTAC's call for support in implementing WRIT. The Trust provides ophthalmic services to two districts (total population 500,000), allowing testing of a wide range of adoption scenarios.

Main Findings

The NHS Foundation Trust described in its application how retinal imaging was an area of growing interest for the Trust. The Trust was considered to be 'progressive' towards change and had developed a programme of service improvement which aimed to promote the adoption of technological innovation to healthcare efficiency and effectiveness. As the Executive Director for Business Development in the Trust explained:

' ...As part of our strategic direction in the future, we wish to develop our research and development approach and we also want to develop our approach to technology adoption, innovation adoption…Well, l think that as an organisation we are pretty good at developing a business case and relating to new technology and deciding to adopt it if it washes it's face if it makes sense if it raises our returns on our investment…I think that side of this is actually very good, but in terms of the input to

that, it's pretty much purely driven by the clinicians who may or may not be interested in using this area to advance their clinical care…'

The Trust generally had a good relationship and understanding with its PCT. The Chief of Business Development at the Trust had obtained a commitment from the PCT to provide financial support in the procurement of the technology in order to evaluate its utility, especially with a view to determining if a part of the examination process could be moved out into the community. In this context, hosting an NHS adoption project was therefore perceived to be a natural complement to the Trust's programme. During a discussion about the Trust's initial interest in adopting WRIT, a senior project manager in NTAC explained:

'...It's an ideal scenario because they already had – with hindsight obviously we know this – and they already had a really excellent working relationship with their PCT in terms of – specifically in terms of adopting new technology, new innovative technology. And the WRIT product, the optimum product is highly innovative. They already had the – an understanding, the support, and particularly an understanding of financial support from the PCT for the project. So ideal situation; the trust already has earmarked funding to procure this technology…'

The Trust had also recently become a research partner in two large scale technology integrating EU projects. Moreover, the ophthalmology department had recently appointed a new retinal specialist who aimed to be one of the pioneers in the adoption of WRIT. This made the Trust an 'ideal' site for the adoption of the WRIT. As a senior project manager explained:

'And I got that impression when I did the due diligence interview with him, and involved with him was the lead Ophthalmologist who would in fact have been the clinical lead for the project had it gone ahead then. He'd had previous contact with the technology; he knew about it, he knew what you could do with it, he knew what the technology promised. So really excellent set up in terms of financial support, in terms of clinical support, in terms of organisational support. Organisational support coming from M.P and clinical support, Ophthalmologist; the financial support, PCT… All bases covered…'

In this context, the potential enrolment of the clinical, organizational, managerial and financial support network from both the PCT and the Trust was perceived as a key enabler for the adoption of WRIT. From a clinical perspective, the technology claimed that it could replace the current practice of diagnosis by direct visual examination of the retina after dilating the pupil. It was expected to provide a much faster detection of pathology, by removing the need for a lengthy pupil dilation process prior to examination, allowing for a better patient experience and shortening the examination period itself. As such, it was claimed that the adoption of WRIT could result in enhanced patient benefit (through earlier intervention, particularly for peripheral pathologies) and reduced waiting times. The potential clinical capabilities of WRIT were expressed as follows in the application submitted by the Trust to NTAC:

'Reduced waiting times by elimination of the pupil dilation stage in the pathway where appropriate…Improvements in diagnostic capability through high definition imaging being made routinely to all relevent patients…200 degree imaging will enable peripheral retinal abnormalities to be identified at the earliest possible stages…This will allow improved prognosis through application of curative or disease modifying technology at the optimal stage of disease progression…'

From an organizational perspective, the adoption of WRIT was translated in terms of improving patient throughput performance and reducing unnecessary referrals. Thus the adoption of WRIT was presented as an opportunity for the Trust to improve patient care in terms of effectiveness and efficiency. During a conversation about its potential benefits the producer of WRIT commented:

'Bigger opportunity to treat, more patients, still a huge amount of unnecessary referral and the pretty archaic way patients are managed once they arrive in the clinic. And imaging, whether it's our imaging or anything else could play a huge role in improving patient management, documentation, improving the standard of care patients get, improving the speed in which they get through an Ophthalmic clinic. The patient can be in the clinic all day, the doctor probably only sees them three times for thirty seconds. A lot of the tests, particularly ours and some others, really could

easily be captured in the initial waiting period so that data would all be up on the screen, in the consulting room'

It was also claimed that it could be possible for the imaging itself to be carried out by an imaging specialist in primary care, rather than an ophthalmologist in secondary care, creating the possibility of pathway redesign. The lead clinician was keen to cut unnecessary referrals from primary care in order to optimise use of clinicians' time and to increase throughput of patients with a genuine need to see a consultant at secondary care. The potential for service redesign through technology adoption was highlighted in a 'due diligence' report produced by NTAC to evaluate the Trust's application, placing technology at the center of change to current practice.

'Retinal imaging is an important tool for the screening and diagnosis of eye problems, such as retinal detachment, glaucoma, cataracts, retinal holes/retinal tears and age-related macular degeneration…this technology could be used in either primary care or secondary care and can prevent a high degree of false positive referrals [to secondary care]'

As the above comments illustrate, a central element of the clinical capabilities of WRIT was a potential improvement of clinical performance together with a redirection of resources from secondary to primary care (i.e. service redesign). Although the Trust was already aware of the potential benefits claimed for the new technology, there was still no consensus among the clinicians as to whether or not the technology could add much value to existing clinical practice by replacing the current pathway. Following a period of onsite visits and a presentation of WRIT in the department, uncertainty was raised among the clinicians around the clinical efficacy, the overall cost of technology and the quality of the image required to provide sound diagnosis. In particular, some clinicians expressed the view that the technology did not provide an opportunity for service process improvement and the related costs were so high that it was far cheaper to simply replace their existing fluorescein angiography camera. During a discussion about the clinicians concerns, a lead consultant commented:

'...I mean, we saw the pictures and they said what are the advantages, that gives a wider view and a clear picture. But I think people felt that it is more like what we can see with the indirect ophthalmoscope, like how we examine patients, and the specifics we can gain from the technology are already available from other technologies like OCT for example…And I think the main opinion at that time was that it is not needed, it doesn't say it's a bad technology but it's not needed because we have already means, all the means that we need. So we don't need this extra technology because of the cost involved of course of introducing new technologies…'

These concerns of clinicians over the clinical efficacy of WRIT led the Trust to question its initial interest in adopting the technology. In so doing, issues related to investment and staff training and re-configuration of clinical practices started to emerge in the Trust.

'So, you know, as I said, it's a nice thing but do we really need it? Do we really need to buy it? And also when you buy something like that you need to train people to use it, to interpret it. And it's a lot of not only just to buy something, it takes a lot of time and effort for the department to integrate it into the medical practise. So it's not easy to introduce something unless it's really necessary.'

Moreover, notes of a meeting between the Trust and NTAC revealed that the potential of reducing unnecessary referrals to secondary care, whilst benefitting the local health economy, could result in a loss of income to the Trust. Essentially the risk of loss of income depended upon the uncertainty attached to whether the loss of income due to avoiding false positives would be compensated by the gain in income of reducing false negatives. Moreover, reducing unnecessary referrals would create further risks and uncertainties, as new 'filtering' services in secondary care and education work across the primary/secondary care interface would both be required.

'The lead clinician is keen to cut unnecessary referrals from primary care in order to optimise use of clinicians' time and to increase throughput of patients with a genuine need to see a consultant at secondary care. [WRIT] would be used in secondary care to provide a second level of filter (using technician staff rather than doctors) at the point of entry in the secondary care pathway. He is also keen to deploy ...[WRIT] in

primary care (optometrists) as the first line of filtering/detection (with training/support being provided by visiting secondary care consultants)…The lead clinician believes that the deployment of [WRIT] in care pathways would, because of the upstream filtering that it provides, actually result in the identification of a greater number of people requiring secondary care. Consequently, he would not expect to see a reduction in Trust income from deploying [WRIT], conversely to some beliefs.'

From a clinical perspective, doubts were raised with relation to the examination of the retina without dilation of pupils. It was claimed that for the majority of patients seen within the Trust, a clear view of the central part of the retina (the macular area) is essential and the technology did not offer this option.

'Dilating the pupil is not a big deal I think for medical retinal practise. Because most of the patients will need dilatation anyway to have a look at the back of the eyes... most of the retinal pathology is at the back, at what we call the fundus or the central part of the retina, the macular area…You cannot examine the back of the eye properly without dilatation....So, you know, if we have other technologies which need dilatation we will not abandon it for this technology, just because of the lack of need for the dilatation'

Further, it was suggested that peer-reviewed evidence was required to demonstrate the clinical value of WRIT. As a clinician in the Trust explained:

'Well, we are secondary care, this is what I'm saying. Maybe tertiary care, in some tertiary care centres if they would like to promote something like that they should get first university hospitals to get it. And then they will do some research and if they can show it could be of value and publish papers to show that this was necessary to advance our medical practice and management of patients, then we can probably propagate it to other hospitals. But at the moment, it doesn't feature much in the research to show its value…'

Overall, there was considerable doubt about WRIT amongst the ophthalmologists and the Trust determined that the technology did not live up to the promise of replacing conventional methods of clinical practice. Therefore, despite the expectations and

promises of WRIT and its potential benefits for both patients and clinical practice, the outcome as set out in an early close-down report prepared by NTAC, was as follows.

'The feedback …is that they [the Trust] do not consider it viable, medically or operationally, to replace current practice with [WRIT]. The natural place for the technology, as currently exhibited by a unique product, is considered to be high street optical services…Therefore, the project is to be closed down.'

Concluding Remarks

The view of innovation as the outcome of sociomaterial alliances or associations stresses the complex and ambiguous nature of technological innovation, often seen as the assembly of diverse and shifting discourses/representations (Callon, 1991). These heterogeneous discourses that accompany the attempted diffusion of innovation have the potential to create change or enact new organizational realities (Clegg et al., 2006). On the other hand, they also play a crucial role in the 'negotiability' of uncertainty and risk of such innovations. Indeed, much of the negotiability of new technological innovations depends on masking such uncertainty and mobilizing a range of claims about the capabilities and future trajectory of innovation (Borup et al., 2006; Brown and Michael, 2003).

Drawing upon these ideas, this paper attempted to illustrate the negotiability of technological innovation, by exploring the various heterogeneous discourses that entered into the ultimately failed adoption of a retinal imaging technology within a UK hospital Trust. In the context of this study, the emerging tensions between the need to provide clinical and cost-effectiveness evidence for the adoption of WRIT and to manage the inherent uncertainty, resulted in the early termination of the retinal imaging project.. In particular, uncertainties attached to the clinical benefits, the use of the technology, the potential loss of income to the Trust and work involved across the primary/secondary care interface, resulted in the lack of alignment of actors' interests, thus negatively affecting adoption.

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Modern translation agencies utilize a wide range of technologies that make life easier for translators, project managers as well as clients.Â Another step in the development process of machine translation was SMT â€“ statistical machine translation, that brought a statistical approach to automatic translation. Each sentence (word order) was created based on the probability of distribution of each word in a sentence â€“ on the basis of underlying statistical analysis of texts in a particular language. The result was not very accurate but it seemed to have a more natural linguistic flow than RBMT. The combination of the two approaches â€“ RBMT and SMT â€“ appeared to be a logical step that could move automatic translators forward. Technological Innovation in Healthcare. A large and growing body of literature has explored the role and nature of. technological innovation in healthcare (Robert et al., 2010; Faulkner, 2009; Williams. and Dickinson, 2008; Rye and Kimberly 2007; Webster, 2006; Ferlie et al., 2005; Greenhalgh et al., 2005; 2004; Fleuren, Wiefferink, and Paulussen, 2004; WalkerÂ translation of heterogeneous discourses between different groups and individuals in an. attempt to introduce a new retinal imaging technology in a UK hospital Trust. This. Lost in Translation? Good Practice Guidelines for HSE Staff in Planning, Managing and Assuring Quality Translations of Health Related Material into Other Languages. â€œWhen I use a word, it means just what I choose it to mean â€“ neither more nor lessâ€. Through the Looking Glass, Lewis Carroll. Lost in Translation? Good Practice Guidelines for HSE Staff in Planning, Managing and Assuring Quality Translations of Health Related Material into. Other Languages. ISBN 978-1-906218-44-7. 9 781906 218447. 1. Introduction 2. All About Translation 3. Steps in Translating Materials. Frequently Asked Question... Medical innovation as it stands today is fundamentally unsustainable. There is a widening gap between what biomedical research promises and the impact that it is currently achieving, in terms of patient benefit and health system improvement. This book highlights the global problem of the ineffective translation of bioscience innovation into health system improvements and its consequences, analyses the underlying causative factors and provides powerful prescriptions for change to close the gap. It contrasts the progress in biomedicine with other areas of scientific and technological endeavour, such as information technology, in which there are faster and more reliable returns for society from scientific advance.