

**THE PROCESS AND  
ORGANISATIONAL CONSEQUENCES  
OF NEW ARTEFACT ADOPTION  
IN SURGERY**

**by**

**Patricia Lynne Johnstone,  
RN, BHSc(Mgmt) *CSturt*, GDipCom *W'gong*, GDipHlthEc *UNE***

**A thesis submitted for the degree of  
DOCTOR OF PHILOSOPHY**

**Macquarie Graduate School of Management  
Macquarie University  
NSW Australia**

**November 2001**

**- with corrections -**

### **CERTIFICATION**

I certify that this work has not been submitted to any other university or institution. The extent to which I have availed myself of the work of others is acknowledged in the text. Sources of information are listed in the bibliography.

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Signature of candidate:

A handwritten signature in black ink, reading "Johnstone." with a large, stylized initial "J" and a period at the end.

Patricia Lynne Johnstone

Date: 22 November 2001

## ACKNOWLEDGEMENTS

Numerous people have contributed in many and varied ways to my journey that has culminated in this finished work. I am grateful to my supervisors, Professor Elizabeth More and Dr David More for their confidence in my capacity to achieve my goal, their sound academic critique, and their friendship, patience and support throughout the period of my candidature. Their expertise in their respective fields combined to produce the type of supervision that I needed. To you both I say, “thank you”.

I am indebted to all of the people at the five hospitals involved in my study, and the hospital in my region where I undertook some data validation activities, whose work lives I intruded upon in the course of my fieldwork. Without your preparedness to give of your time for interviews, to assist me in my search for, or collection of organisational data, or to allow me to observe you and talk with you in the course of your work, I would have no thesis. There have also been innumerable people at a wide range of organisations, including government departments, who have willingly provided or guided me in locating much of the necessary background data for this study.

My thanks is extended to several of my academic colleagues who, at various times over the past few years have been prepared to listen as I shared the ups and downs of my research journey. Your useful critical comments and sometimes much needed encouragement to me to persevere despite periodic practical setbacks or workload pressures has been appreciated. I must single out my friend and colleague, Jean whose friendship and intellectual acuity I have truly valued. Many other people have taken an interest in my progress, and provided various forms of support. They include the staff in the various university libraries I have frequented over the past four years and friends who have regularly asked, “how’s your research going?” In some respects I have found that completing this thesis has been quite a lonely experience – a very personal journey that in most instances is only possible to share at a very superficial level with most people. So, being given the opportunity to simply reply with “things are a bit tough at the moment” or “I’m making progress” has been important to me. To you all I say, “thanks”.

A special thanks is extended to Martha, whose efficiency at transcribing the many hours of tape recorded interviews was greatly appreciated.

Finally, and above all others, I am deeply grateful to the patience and loving support of my husband, Dennis who has, not only during the period of my PhD candidature, but also during my many years of academic study preceding it, manifested by means of his support of me, our shared belief that everyone has the right to endeavour to fulfil the potential that is in each of us. I trust that our lives will be the richer for my achievement of this goal.

**DEDICATED TO THE MEMORY  
OF MY DAD WHO DEPARTED  
THIS LIFE ON 11<sup>th</sup> July 2001**

## ABSTRACT

Surgical technologies since the late 1980s have undergone substantial innovations that have involved, but not been limited to, the adoption of new machines, instruments, and related surgical materials. The adoption of these types of new surgical technologies, referred to throughout this thesis as *intra-operative artefacts*, typically represents a commitment of substantial financial resources by the hospitals concerned. However, little is documented about the process whereby the decisions are made to adopt new intra-operative artefacts, and no previous research appears to have explored the work-related consequences of new intra-operative artefact adoption within operating theatre services.

The present thesis explores the reasons why new intra-operative artefacts are adopted, how the decisions are made, who are the participants in the decision process, and what are the expected and actual organisational consequences of new intra-operative artefact adoption. In the process, it presents a “rich picture” of technological change in surgical production between 1988 and 1998 in New South Wales’ hospitals.

The context of the study is important, for hospitals are professional organisations in which a dual clinical-administrative decision hierarchy exists. The present thesis shows that decisions to adopt new intra-operative artefacts are clinically driven, mainly by the doctors who are the end-users of the technologies. Their principal goals of new technology adoption are to improve the process and/or outcome of an existing procedure or to provide an alternative new treatment option for a particular medical condition. On the other hand, health service managers take a largely business approach to acquiring these new technologies that causes them to expect benefits to accrue to operating theatre services, and to their hospitals generally, that parallel the expected outcomes of return-on-investment strategies employed by conventional firms when they adopt automating and/or informing machines or other devices. The present thesis shows this expectation to be incorrect. It explains how new intra-operative artefacts do not automate the surgical process in any way and provides substantial evidence that the net effect of new intra-operative artefact adoption has been to increase the labour intensity of surgical production. In the process, it explores the concepts of *choice* and *consequence* of technological change from the philosophical, theoretical and practical perspectives, and offers an interpretation of new technology adoption that contributes to all three.

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## List of abbreviations

AIHW	Australian Institute of Health and Welfare
ALOS	Average length of stay (in hospital)
AN-DRG	Australian National (codes for) Diagnostic Related Groups
AR-DRG	Australian Revised (codes for) Diagnostic Related Groups
D&C	Dilatation of the cervix and Curettage of the uterus
DRG	Diagnostic Related Group
EU	Endoscopy Unit
GDP	Gross Domestic Product
GI	Gastro-Intestinal
HLI	Human labour input
MAS	Minimum access surgery (also known as minimally invasive surgery, or “keyhole” surgery)
NH&MRC	National Health and Medical Research Council
NORSW	(Australian) National Operating Room Service Weight
NORSWs	(Australian) National Operating Room Service Weights
NSW	New South Wales
OR	Operating Room
OS	Operating Suite
OTS	Operating Theatre Service
OTs	Operating Theatre Services
PR	Procedure Room
SD	Sterilising Department
THLI	Total human labour input
TKR	Total Knee Replacement
UK	United Kingdom
USA	United States of America
VMO	Visiting Medical Officer

**Note:** Where definitions are required, they, along with other terms used throughout this thesis, are provided in Appendix E.

## Introduction

This thesis explores the process and organisational consequences of the adoption of new “artefact” (ie. tangible) technologies in the operative phase of surgical production within operating theatre services in hospitals. Five key questions have guided the inquiry. One concerns the technical characteristics of these artefacts and their functional roles in surgical production. The others concern the reasons for their adoption, the expected and actual organisational consequences of their adoption, and the processes whereby the decisions are made to adopt them. In answering these questions, the thesis explores various organisational structural aspects of the surgical production process within operating theatre services and undertakes a detailed study of six representative, high volume surgical procedures in which new *intra-operative artefacts* were employed during the ten-years, 1988 to 1998, which is the timeframe of the present study.

The study sites are five categorically different hospitals in New South Wales, Australia. The key informants to the study are individuals whose work roles within operating theatre services involve the use or care of the new intra-operative artefacts (ie. they are *receivers* of the new intra-operative artefacts) and/or who have the opportunity and/or capacity to contribute to the new intra-operative artefact adoption decision process. They are the doctors who carry out procedures (ie. procedural specialists), operating suite nurses, sterilising department technical aides, and top health service managers.

Throughout the thesis, the term, *surgical production*, refers to all of those activities that contribute to producing any diagnostic or therapeutic procedure undertaken within the operating theatre service of a hospital. It does not include technologies employed in the related fields of anaesthetics or patient recovery. The term, *surgical technologies*, refers to all *artefacts*, *techniques* and *organisation* contributing to surgical production. Surgical technologies are distinguished according to whether they are employed during the course of the procedure (ie. *intra-operative technologies*), or before or after the procedure (ie. *perioperative technologies*). The thesis explores changes in the surgical technologies that are work-related consequences of the adoption of new *intra-operative artefacts* during the ten-year study timeframe.

The research design is a *collective case study*. It employs a mixed methods, mixed methodology approach that combines both inductive and deductive reasoning to draw its conclusions. Its theoretical contributions have been derived using the methods and

assumptions that are consistent with the *naturalistic paradigm*, which is the dominant paradigm of the thesis. It also draws some conclusions using the methods and assumptions of *logical positivism* that have important practical implications for the management of operating theatre services in Australia.

The significance of the thesis lies in its contributions to the bodies of knowledge in three areas in particular: organisation research methodologies, organisation theory, and the management of hospitals. To the first it provides a conceptual model of the research process employed in the present thesis that could assist future researchers in this increasingly accepted but little documented approach.

To organisation theory it makes four theoretical contributions. First, it identifies and defines the various categories of surgical technologies that contribute to surgical production, and presents a conceptual model of the process relationships between them.

Secondly, it offers a reasoned contribution to the unresolved philosophical debate concerning voluntarism and determinism as it is articulated in the socio-techno-organisational literature – a contribution whose conclusion is based on the logic that in the micro-level organisational analysis of technological change examined in the present thesis, *choice* and *consequence* are independent constructs.

Thirdly, and building on this foundation, the thesis extends previous empirical work on *multiple-actor decision-making in professional organisations* by identifying seven categories of stakeholder participation in the new intra-operative artefact adoption decision process, five of which are *decision roles*. Arising from this analysis is a 7x2 matrix, described as a *situational stakeholder participation and adjustment matrix of technological change*, which provides a means to describe the two dimensions of *choice* and *consequence* as they relate to two characteristics of stakeholders: their *role(s)* in the new intra-operative artefact adoption decision process and their new intra-operative artefact *receiver status*. A central tenet of this approach is that stakeholders' roles in the decision process and/or their receiver status (ie. *receiver* or *non-receiver*) can vary from one new intra-operative artefact adoption scenario to another. However, the decisions to adopt or not to adopt particular technologies, lie with the clinicians, the procedural specialists in particular, who are very influential in the choices made between- and within-technologies.

Fourthly, the thesis provides persuasive evidence that the characteristics of new intra-operative artefacts, the process of their adoption in hospitals, their organisational performance outcomes, and their consequences for receivers, are largely inconsistent with the

explanations contained in the techno-economic theories of production and management perspectives that are manifested today in the strategic return-on-investment logic that typically results in organisations downsizing their workforces when new technologies are adopted. However, health service managers have very little influence in choice of technology decisions concerning the adoption of new intra-operative artefacts, although their expectations of organisational benefits of new intra-operative artefact adoption are generally consistent with the consequences of applying such a logic. These expectations, combined with the Australian Government's estimated costs of producing individual surgical procedures, influence managers' operational decisions about levels of human resourcing in operating theatre services. The present thesis contends that these estimates might not be accurately representing the actual human labour involved in "producing" specific procedures and, hence, the true cost of surgical production in many operating theatre services. In this connection, the thesis presents convincing evidence that, not only has average operating time (and hence, the *direct labour* requirements of surgical production) increased as a consequence of new intra-operative artefact adoption between 1988 and 1998, but the *indirect* (ie. perioperative) labour input to surgical production has also substantially increased. These latter conclusions represent the practical contribution of this thesis to the management of hospitals in Australia.