Workarounds: the benefits and the risks

WORKAROUNDS: THE BENEFITS AND THE RISKS

MARTIN WHITE

CONTENTS

DEDICATION

For Nick, Simon, Noah, Samuel and Oliver

PREFACE

By training I am a chemist and by profession I am an information scientist, enriched with metallurgy, electronic publishing and market research along the way. This kaleidoscope of a career has taken me to almost 40 countries and inside over 100 organisations, ranging from the United Nations in New York to a convent in London.

I started my career as an Information Officer in two trade organisations for the non-ferrous metallurgical industry. A core element of my role was to answer technical enquiries from member companies, and I quickly learned that what callers started out asking for was not in fact what they wanted to know. The experience taught me to listen carefully and not be afraid to ask questions that would clarify their requirement, a core skill for a consultant.

In 1982 I joined Logica PLC, at that time a highly successful and visible systems development and integration company, heading up a team of consultants trying to make sense of the telecommunications market as broadband services started to arrive. Despite being a senior manager, I had to attend a one-day induction course. The primary message was to highlight the difference between a system that was fit to specification and a system that was fit for purpose. Logica made a passion

out of developing systems that were fit for purpose even if the company had to take a profit hit on the contract. It knew that more business would result from this focus on user expectations and the user experience.

Fifteen years later I started up Intranet Focus Ltd. as even by 1999 it was becoming clear that the early intranets were not meeting expectations. My standard approach at the start of a project was to talk to a small number of employees at various levels within the organisation, ideally including the Chief Executive. From the information I collected I could then decide where to broaden the number of interviews. From the start of my intranet work I discovered quite quickly that the procedures that employees needed to undertake on a regular basis (e.g. booking a meeting room) often overly-complex. They may have been fit to specification but certainly not fit for purpose. As a result workarounds had been developed which invariably remained invisible to managers. In the course of the next 100+ projects and 20 countries the extent of the workarounds never ceased to amaze and concern me.

Somehow during the course of my career I have found the time to write nine books. Each has been a learning experience, challenging me to explain topics to readers in a level of detail that my clients had never required. This is my tenth book, and it really is time to stop. However, this book is very different from its predecessors as they were all written almost totally from my own experience. This textbook is based to a much greater extent on research literature – after all I have been

honoured by the Information School with the title of Visiting Professor for over 20 years. This book is going to be the nearest I will ever come to writing about topic with a combination of the rigour and analysis of an academic (albeit a visiting version) and the experience gained from my consulting work.

When I started writing this book, I had little idea of what I would find in Pandora's Box, and my literature collection is now the largest on any topic in my personal digital library outside of 'search'. It was a fascinating journey, especially as I began to appreciate the insights that the research community has uncovered that could be of value to IT managers.

I hope the results shed new light for you on the challenges that every organisation faces in managing the flows of data and information amongst its employees and also with suppliers and customers. Workarounds and shadow IT can have an important contribution to make in supporting these flows, but the risks are also very significant. Balancing the benefits and the risks is what this book is all about.

Martin White

Horsham May 2023

FOREWORD

I first met Martin when we asked him to review our Search and Redact product, which was then 'nascent' at best. It was an interesting meeting: we had not met previously, I had not arranged the meeting and my expectations were not particularly high. Martin told me at a later meeting that his expectations were similarly modest! Jaded, in both our cases, may have been the apposite word. Of course the meeting turned out to be excellent, we hit it off personally and professionally and since then over the years Martin has been of great help to us with his combination of expert knowledge, affability and approachability. Those words also apply to this book: it is full of real expertise, it is an enjoyable read and it is highly readable.

I have not read this book from an academic viewpoint, probably because I am not an academic. I am what might be termed a 'practitioner'; I am never quite sure if that isn't a euphemism for something less complimentary, but never mind.

I have been both a creator of and a victim of workarounds in their various forms throughout my career. In the early days of my career I worked for Digital Equipment Corporation, which sadly no longer exists but was then second only to IBM.

As a young IT gun I came up with a new way of performing the Material Requirements Planning calculation. This was the heart of what we then called the 'MRP' (aka ERP) system. It was taking 14 hours to complete this calculation. My solution, which was largely based on using memory (yes we did have memory back then!) instead of disk I/O reduced this to 40 minutes. This was then used with success in the plant where I was based, but we could not persuade any other DEC plants to use it. I assumed then that this was due to a 'not invented here' attitude, but in fact it was more down to the fact that using this software also entailed a customisation of the standard MRP package that all the plants were using, and thus constituted ..... a workaround! The truth of the matter was that almost every DEC plant was customising this system in its own way – creating its own workarounds – which inevitably led to all sorts of issues when a new standard version of the corporate package was released.

The term workaround was not used at the time, we referred to it as customisation, but in fact we were dealing with workarounds.

So many of the concepts contained within this book applied to that situation, and could have been of real help in getting the situation under control:

- This was a large scale case of *Shadow IT*
- From a management point of view a *classification* of workarounds would have helped enormously

- Technical debt was being incurred at a massive rate. Each plant essentially had its own bespoke system; upgrading to the latest version of the corporate MRP system was virtually impossible
- As described in the book, managers were faced with often competing factors when deciding whether to accept customisations, in particular the balance between compliance risk and the expected gain in efficiency from the workaround. This was even more insidious because the decision in many plants was in truth the other way round: whether to accept the latest 'standard' corporate version.

For me, the value of this book is its clear and precise definition of the home truths regarding workarounds, and its invaluable advice as to how to address workarounds, which is largely a question being aware of them in the first place; once identified they can be managed.A great value of the book is its mapping of what could be considered 'academic' theory to recognisable real life business processes and systems. The book is by no means a negative prescription for the avoidance of workarounds: it is a prescription for the *management* of workarounds, leading hopefully to the extraction of meaningful added value to business processes and solutions.

Tim Barrett, CTO, Nalanda Technology

INTRODUCTION

The purpose of the University of Sheffield Pressbooks initiative is to provide a platform for academic staff to write text books for undergraduate and graduate students that can be published under an Open licence. This book is written as a text book for information science, computer science and business studies students. It is not specifically written for IT managers but I hope that they might find the subject, and the significant amount of research that has been published, of interest. IT managers can skip the chapters on enterprise application implementation (Chapter 3) and digital workplaces (Chapter 10); these chapters are included to provide context for students with little or no experience of the challenges of IT implementation projects!

Because it is written as a text book there are over 150 citations to the research literature. However the book is not intended to be either a critical or systematic review of the literature, which probably extends to well over 1000 papers. I have summarised some of the outcomes of the research but not assessed its value or compared the results across a range of papers. My objective was to provide students with some starting points for research into the topics covered by the book. A feature of this book is that research papers and theses with

substantial literature reviews are listed with the number of citations they include. The number of citations is not of course a quality indicator but hopefully research students will find them of value as they start to frame their research projects. Each chapter lists citations that are especially relevant to the scope of the paper, though not all are referenced in the text. There is also an integrated list in an Appendix to the book, together with a note about the research resources I consulted in writing the book.

The book covers both enterprise applications and clinical applications. The similarities and differences are both interesting and important, as I feel that the two communities could well work together to learn from each other. A note on notation might be appropriate here. I have referred to 'organisations' rather than 'businesses' because the research indicates that the issues of workarounds pervade both the private and public sectors. I have used the term 'clinical' to cover all health-care organisations. I am also well aware that there are many ways of referring to what I refer to as 'EHR' applications. I also use the term 'enterprise' when referring to applications that are implemented widely across an organisation without necessarily conveying that I am only referring to large organisations.

The research papers often make proposals on how to manage workarounds so that both benefits and risks to the organisation and to individual employees can be realised, but there are very few 'after the event' papers that assess the success

of the measures that have been taken. There are many areas related to workarounds where there is potential for further research and management attention and I have suggested some of these in Chapter 13.

This book was started several months before the launch of ChatGPT by OpenAI. Although the potential impacts of AI are discussed briefly in Chapter 11 it is far too soon to make any predictions about the ways in which AI applications will either increase or decrease the development of workarounds. Hopefully what you learn from this book will enable you to make your decisions on the direction of travel of workarounds and Shadow IT in the immediate and near term.

Chapters 1 – 4 provide an introduction to workarounds, starting with the way in which multiple workarounds brought the three Apollo 13 astronauts safely back to earth. Chapter 2 considers some non-IT workarounds to show that the concept reaches beyond technology. A signficant amount of research and analysis has been published with the objective of defining the characteristics of workarounds and the reasons why they arise. A primary cause being the rapidly increasing complexity (from a user perspective) and this is the subject of Chapter 3. Chapter 4 considers just a few of the probably hundreds of research papers on this aspect of workarounds. Chapter 5 outlines the qualitative and quantitative methodological options to making the usually invisible workarounds visible.

Chapter 6 sets the scene for a more detailed discussion about the way in which workarounds seem to flourish in large

enterprise applications, with a comparison of the similarities and differences between enterprise applications and clinical support applications. Enterprise and clinical support applications are then considered in more detail inChapters 6 and 8, with shadow IT, feral IT and software application development being covered in Chapter 7.

Opinions vary widely but there is a general acceptance that unstructured information represents perhaps 80% of enterprise content. The current attention being paid to business process management and process mining might help to identify workarounds in structured data processes but workarounds in unstructured information may be much more difficult to trace and ameliorate whilst potentially representing significant business risks. Chapter 9 focuses on information workarounds, with a more general consideration of risk and technical debt in Chapter 12.

In Chapter 10 I start to look at the future, considering the extent to which workarounds could have an impact on the achievement of a digital workplace. Digital workplaces are increasingly making use of AI-enabled processes and in Chapter 11 I take a view on how AI generative applications could turn into workaround machines. This chapter may well need to be updated in the very near future! Both risk management and technical debt management are discussed in Chapter 12. Finally in Chapter 13 I offer some reflections on the past, present and future of workaround discovery and governance. I also suggest some areas which represent good

research opportunities and make some recommendations to IT managers.

In the Appendix I set out the way in which I went about undertaking the research for this book, and there is a consolidated list of references ordered by the first author. I have also suggested a core list of references that would be a good starting point in gaining an initial appreciation of workarounds and shadow IT.

ACKNOWLEDGEMENTS

This book would not have been possible without the advice, support and above all encouragement of Maria Mawson (Faculty Librarian, Social Sciences) and Helen Moore (Faculty Librarian, Engineering and Science) at the University of Sheffield Library. I have written nine previous books with various publishers but none have worked with me in such a collaborative way as Maria and Helen as we solved problems collectively in the course of the evolution of the book.

Val Skelton edited the book many times in the course of its development but any remaining errors and omissions are mine and mine alone.

An important factor in the approach I have taken to this book as a text book has been the inspirational research and teaching commitment from my colleagues at the Information School, University of Sheffield. They collectively have set a benchmark that I have aimed for but am under no pretensions that I have achieved. I am also very grateful to the Information School for my appointment as a Visiting Professor. This brings with it the ability to use the Digital Library to locate the significant amount of published research that is not open access.

Nancy Berlinger encouraged me to write this book when I

started out on the research process and came across her book 'Are Workarounds Ethical'. Carrie Elliott (Syracuse University) kindly made a copy of her PhD thesis 'The Preclusive and Productive Power of Information Systems: Psychiatric Clinicians, Electronic Health Records, and the Making of Health Information' available to me. James Robertson (StepTwoDesigns) was also very encouraging.

A number of colleagues have read through the book at various times on its journey. In particular I must thank my colleague Emeritus Professor Peter Willett and also Tim Barrett, CTO of Nylanda. Both provided invaluable mid-course corrections at a time when the book was trying to serve a multitude of potential readers, none of them at all well. I am also indebted to Tim for agreeing to write the Foreword to this book. Alan Pelz-Sharpe (Founder and CEO of Deep Analysis) and Frank Giroux (Bayer Pharmaceuticals) raised a number of issues that I needed to address in more detail.

AUTHOR BIOGRAPHY

Martin White has been a Visiting Professor at the Information School since 2002 and is also a member of the Advisory Committee of the School. He specialises in information management and information retrieval and lectures on enterprise search.

A chemist by training Martin started work as an information scientist in 1970, using 10,000 hole optical coincidence cards to undertake literature searches.

In 1996 he undertook an assessment of the potential of intranets in organisations, and this led him to set up Intranet Focus Ltd. in 1999. His most challenging intranet project was with the International Monetary Fund in Washington DC in 2001 where he started work the day before 9/11.

Many of his clients have been multi-national organisations with complex information management and information discovery challenges. His particular area of interest is in finding solutions for organisations working in multiple languages, especially in the pharmaceutical and high-technology sectors.

Martin has written nine books, including Enterprise Search in 2015 and a History of Enterprise Search 1938-2022. In 2023 he closed down Intranet Focus Ltd and set up SearchResearch.com for which he acts as Principal Analyst.

Martin is a Fellow of the Royal Society of Chemistry, a Fellow of the British Computer Society, an Honorary Fellow of the Chartered Institute of Library and Information Professionals and a member of the Association for Computing Machinery (USA). He is also a member of The Search Network.

LinkedIn Profile

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TO THE MOON....AND BACK

In this chapter

If someone asked you what you meant by a workaround there is probably no better illustration for them than the events that took place after an explosion on the Apollo 13 spacecraft as it began its journey to the Moon in 1970. The film 'Apollo 13' is a fairly accurate depiction of how the team in Mission Control rebuilt the entire mission schedule to ensure that the three astronauts returned safely to Earth. This chapter summarises what took place in 1970 and considers the implications for a better understanding of the concept of a workaround. The Apollo 13 explosion was a direct result of a workaround by engineers in the lead-up to the mission, a good example of how a workaround may seem to be effective to the developer but the downstream impacts may not be apparent. Tragically a workaround to achieve an on-time launch of the Challenger Space Shuttle in 1986 had disastrous consequences.

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To begin at the beginning (to quote Dylan Thomas) it

would be appropriate to offer a definition of 'workaround'. A good place to start is always the Oxford English Dictionary, though interestingly the word did not enter the OED database until September 2014.

"The word workaround has entered general English usage to refer to a makeshift method of overcoming or bypassing a problem, but until recently it was limited primarily to technical contexts. First attested in 1961, for its first two decades it was used primarily in aerospace jargon. For instance, in 1965, the Oakland Tribune reported that 'Project Apollo executives are trying short-cuts, improvisations and 'work-arounds' to keep the moon schedule from slipping out of the '60s and into the '70s' (12 Sept.). By the 1980s, the term had also been adopted by the computing industry to refer to a method of overcoming a performance issue or limitation in a program. Adoption of the workaround in nontechnical contexts is a relatively recent development."

The Cambridge Dictionary offers a single sentence definition.

"A workaround is a way of dealing with a problem or making something work despite the problem, without completely solving it."

The simplicity of these definitions has not inhibited a very considerable effort on the part of the academic research community to propose more extended definitions, and these are the subject of Chapter 3. The focus of this research has been primarily in the use of the term by IT professionals from

the time that the concept of 'working around' IT problems was proposed by Leslie Gasser in his PhD thesis in 1984 (Gasser 1986). This is in line with the comment from the OED that the term was adopted by the IT profession in the 1980s.

Workarounds are usually adaptations of an application under the governance of corporate IT. The term 'shadow IT' is used to describe applications which have been developed and used without the agreement of corporate IT. It could be argued that shadow IT (often written as Shadow IT for emphasis) is an example of a workaround.

By their nature workarounds and the use of shadow IT are invariably invisible to all except those who develop and adopt them. This makes talking about (and indeed writing about) workarounds something of a challenge. Fortunately, there has been one major event with a global audience that is the definitive account of how workarounds avoided a potentially tragic and globally visible conclusion of a planned flight to land on the surface of the Moon and return safely.

The first crewed Mercury flight took place on 5 May 1961 when the Freedom 7 spacecraft, piloted by Alan Shepard, achieved a suborbital test flight. Nine months later, on 20 February 1962, John Glenn orbited the Earth in his Mercury spacecraft Friendship 7. It is quite amazing in retrospect that despite the colossal technical and human challenges in eventually achieving the moon landing on 16 July 1969 the only fatality in the entire history of the Mercury, Gemini and Apollo missions was when the three Apollo 1 Mission

astronauts died in a fire whilst testing out the capsule on the launch tower at the Kennedy Space Center in Florida.

"I believe we've had a problem here"

Apollo 13 was to be the seventh crewed Apollo mission and the third to land on the Moon. The mission was commanded by Jim Lovell, with Jack Swigert as command module (CM) pilot and Fred Haise as Lunar Module (LM) pilot. Swigert (from the back-up crew) was a late replacement for Ken Mattingly, who was grounded after exposure to rubella. Fortunately NASA always had a back-up crew that shadowed the primary team very closely so there would be no significant gap in expertise.

An Apollo Lunar Module is on display at the National Air and Space Museum in Washington. The Apollo Command Modules were (at least to some extent) based on the evolution of the Mercury and Gemini capsules but the Lunar Excursion Module (LEM, later just LM) had no antecedents. The Apollo capsules could be tested in Earth orbit but there was no way to test the LM for landing and takeoff from the Moon.

Apollo Lunar Module

Photograph © The author

The LM presented some very significant challenges to ensure that the astronauts landed safely and could take off from the surface of the Moon with just a single engine and no redundancy. Throughout the design and manufacturing it was an ongoing problem to keep the weight within what could be lifted off with the Saturn 5 rocket. As a good example the seats originally included for the astronauts were taken out as it would be easier to manage the LM standing up as well as saving weight. There is an excellent account of the development and manufacture of the LM by Kelly (2001) which highlights many workarounds that had to be adopted to keep to

specification and schedule as well as the situation inside Mission Control during the Apollo 13 mission.

The launch took place on 11 April 1970. The mission very quickly had its first problem when the engine in Stage 2 developed a fault and shut down early. The spacecraft still achieved Earth orbit but only with a change in flight plan.

All the power and life support systems were contained in the Service Module, including two tanks containing liquid oxygen. This was used to power the fuel cells to give electric power, as well as oxygen for the crew and water as a by-product of the fuel cells in operation.

It was important to maintain the temperature of the oxygen tanks as the oxygen was used up. This was accomplished by a heated tube running the length of the tank with fans on either end so that the oxygen could be stirred as well as heated to achieve a consistent temperature. Detecting the level of the liquid oxygen was not easy and the method used was prone to errors caused by variations in density in the tanks, again a reason for them being stirred.

Just over 55 hours into the mission, Mission Control asked the crew to stir the tanks as they had a concern about the quality of data on the oxygen levels. Shortly after initiating the stir there was a loss of data from the spacecraft, and the crew heard a loud noise from the Service Module.

This caused Swigert to say to Mission Control "I believe we've had a problem here".

Workarounds en masse

It did not take long for Mission Control and the Apollo 13 crew to realise that the outcomes of the explosion meant the end of the mission and the focus moved very quickly onto how to get the crew back to Earth. From that time onwards every action was a workaround. These have all been well documented, especially from the Grumman Aerospace perspective (the company that built the Lunar Module).

There were two very important elements of good fortune at this point. The first was that the spacecraft was at a point in its journey to the Moon where there was time to revise the orbit and have the gravity of the Moon capture the spacecraft and put it back into a return orbit with just a small amount of assistance from the LM engine, which was never designed to cope with the weight of the entire spacecraft.

The second element was that early in the design of the LM there was a discussion about using the LM as a lifeboat should there be a problem with the oxygen and power supplies in the Command Module and so there was oxygen on the LM to sustain a return to Earth. What was not considered was the build-up of carbon dioxide as the lithium hydroxide purification canisters on the Command Module and the LM were completely different in shape and construction, having been developed by two different companies. This led to Mission Control having to develop a workaround 'tube' that could be constructed by the astronauts from items of card, plastic and tape already in the Command Module.

As well as the internal resource issues the return route back

to Earth had to be recalculated, a major problem with the computer capacity in resources available in 1970. The recalculations had to take into account the fact that the combined weight of the spacecraft was radically different from plan because of the damage to the Service Module and having to return with the LM attached until quite close to the re-entry stage. In addition most of the computer systems in the Command Module had to be turned off to conserve the battery power and there was no precedent for reactivating them. As a result new sets of commands had to be read out by the team at Mission Control and copied down onto paper by the astronauts in almost freezing conditions. A facsimile of the LM Systems Activation Checklist has been published and gives a good indication of the complexity of the LM systems.

The Command Module returned to Earth successfully on 17 April.

Without doubt the mission was probably the most visible and complex set of workarounds in history. Had they failed the astronauts would have died and the entire space programme would have been overshadowed by their deaths.

The genesis of the failure

There was of course an investigation into the cause of the failure of the Service Module. The story begins about 18 months prior to the Apollo 13 launch. An oxygen tank intended to be used in Apollo 10 was dropped a few centimetres onto the floor of the launch building but appeared to be undamaged. A replacement was fitted for Apollo 10 but

the original was then allocated to Apollo 13. Three weeks before launch the tank was filled with oxygen as a standard test but it was found to be slow to empty. As a workaround the technicians switched on the heaters in the tank to boil the gas out.

The original specifications developed a decade earlier were for 28 volt spacecraft systems. However, the launch site used 65 volt systems and when this was applied to the tank switches they became welded shut and the insulation was also damaged. The oxygen boiled out as expected and the technicians had no reason to think that there had been any internal damage.

When the astronauts switched the fans on a short circuit in the damaged insulation caused a spark in the wiring and this caused the explosion.

The workaround had a completely unexpected outcome, with its basis in a failure of information management. The change in systems voltage had never been communicated to the manufacturers of the internal switches in the tank. A classic example of a workaround having an impact much later on in a series of process steps.

The role of Mission Control

In the case of Apollo 13 the astronauts themselves did not develop the workarounds but did have to have complete trust in the instructions that were being sent up to them to execute. The scale of the effort at Mission Control to save the lives of the astronauts is only partially presented in the accounts of the

mission from the astronauts themselves, notably the book by Mission Commander Jim Lovell (Lovell and Kluger 1994).

To understand the immense amount of work being undertaken at Mission Control the definitive resource is an autobiographical account by Flight Director Gene Kranz (2000) who not only provides a wealth of detail about the scale, speed and innovation of the workaround development but also documents the many other workarounds that Mission Control had to manage during the preceding Mercury, Gemini and Apollo missions. The book also illustrates the commitment of the NASA management to learn from the lessons of these workarounds, ensuring that the same problem never emerged a second time during the course of the missions.

The Challenger Space Shuttle disaster

To this day I can remember 28 January 1986. Just as I was about to leave my hotel room in New York for a lunch meeting with colleagues my wife Cynthia phoned me from the UK to tell me the news of the Challenger Space Shuttle disaster. Ten minutes later as I walked into the office it was clear from the office buzz that my colleagues were unaware of the launch catastrophe. It was not easy to convince them of the magnitude of the disaster and the impact it was already having in the USA and the rest of the world.

The full story of the causes of the disaster has been presented in detail by Vaughan (1996) and McDonald (2009). In essence the elastomer O-rings sealing the sections of the booster rockets failed as a result of becoming inflexible in the

quite cold conditions of the launch. The final launch approval meeting recognised that the cold temperature of the launch might have an effect on the O-rings but lacked any experimental data on the degradation of the flexibility at close to the ambient temperature. As a result members of the team had to workaround inadequate information to make their decision at a time when there was pressure from NASA to move ahead more quickly than had been the case to that date on scheduling Shuttle launches.

The impact of the low temperature on the O-rings was brilliantly illustrated by US physicist Richard Feynman during the hearings of the Commission set up to identify the issues and how the procedures should be changed. His ad hoc demonstration using an O-ring acquired from a museum and a glass of iced water is still regarded as a classic example of how to make a complex issue understandable.

There were no future problems with the Shuttle launches. Sadly the Shuttle programme was brought to a premature close as a result of the Columbia shuttle breaking up in the atmosphere on its return in 2003, the outcome of several of the heat-resistant tiles being destroyed as a result of debris breaking off the booster rockets at launch which damaging the tiles. This time there was no workaround available.

The bottom line

The issue of a definition for a workaround is important, because if there is no agreed definition of a workaround how can it be detected and assessed for its impact. For example, does

a workaround have to be something that reoccurs on a regular basis, or (as is the case with Apollo 13) can it be a one-off way of solving a problem. The fact it was a workaround that inadvertently resulted in the on-board explosion highlights the fact that the impact of a workaround might not be immediately obvious to the employee adopting it. It could be argued that Apollo 13 is a special case as it is not specifically related to IT issues. In the next Chapter some more examples of workarounds in a more general sense are presented.

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WORKAROUNDS - HERE, THERE AND EVERYWHERE!

In this chapter

In Chapter 1 the quotation from the Oxford English Dictionary highlighted the way in which the term 'workaround' had started off as aerospace jargon and only more recently has it been adopted in the IT industry and also as a colloquial expression for situations where there was little or no IT involved. This chapter highlights just a few examples of this wider use to provide a balance to the remaining chapters of this book which focus on the use of the term in the context of the user experience of complex IT applications.

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Recipe management

Most of us have collections of processes on our shelves masquerading as recipe books. When choosing a recipe to cook for supper the initial check is whether or not we have all the listed ingredients. This is not a simple task, if only because we are certain that we have a specific spice only to discover in the

preparation stage that the spice has been in a poorly sealed jar and has long since oxidised and lost its zing. The challenge is then to find a suitable workaround, though we probably do not regard it as such. It is not uncommon for the author of a recipe book to offer workarounds and suggest that, for example, chicken can be substituted for veal.

The process remains the same in terms of steps and sequence, so the use of the term 'workaround' is entirely appropriate. Of course, if the workaround is successful then it is unlikely that we will disclose to our guests what we have done to deliver a tasty meal whilst coping with a lack of one or more of the ingredients. If the reaction is really positive then we will make a note in the margin of the book and use the adapted recipe in future. The problem we may then face is that our guests ask for a copy of the recipe and we then have to disclose the changes we made to the recipe earlier in the day!

The 'recipe' metaphor could be useful in explaining to students and to employees the main features of a 'workaround' without needing to take an example from their own experiences.

The due process of law

However defined, at the core of a workaround is a modification to a process. The concept of a process dates back to the 14th century. The 'due process of law' is a fundamental principle of fairness in all legal matters, both civil and criminal, especially in the courts. All legal procedures set by statute and court practice, including notice of rights, must be followed for

each individual so that no prejudicial or unequal treatment will result.

In English law the due process principle is enshrined in the Observance of the Due Process of Law, a statute that was passed in 1368 under King Edward the Third.

"ITEM, At the Request of the Commons by their Petitions put forth in this Parliament, to eschew the Mischiefs and Damages done to divers of his Commons by false Accusers, which oftentimes have made their Accusations more for Revenge and singular Benefit, than for the Profit of the King, or of his People, which accused Persons, some have been taken, and [sometime] caused to come before the King's Council by Writ, and otherwise upon grievous Pain against the Law: It is assented and accorded, for the good Governance of the Commons, that no Man be put to answer without Presentment before Justices, or Matter of Record, or by due Process and Writ original, according to the old Law of the Land: And if any Thing from henceforth be done to the contrary, it shall be void in the Law, and holden for Error"

This statute is the first reference to 'process' in its current use as a string of related activities resulting in a defined outcome. It was not the first use of 'process' as a verb which dates back to the 1250s. Lawyers have spent the last 655 years working out how best to work around these due processes in a way that maintains their legality but have the desired outcome for the people they were representing.

The importance of this Act lies not just in setting out the legal definition of a process but its consequences. With law

being regarded as a process anything related to law (taxes, wills, land ownership etc.) also needed to adopt processes as a core element of their framing and use.

It is not surprising that when taking into account English law the Founding Fathers of the United States adopted the concept of due process in U.S. law as now set out in the Fifth Amendment to the U.S. Constitution. This provides "No person shall...be deprived of life, liberty, or property, without due process of law," and is applied to all states by the 14th Amendment.

Political decisions in the United States of America are very tightly linked to its Constitution, but as Tushnet (2009) shows there are many examples of how the text of the Constitution and subsequent judgements of the Supreme Court interpreting the text give rise to workarounds that can be used to speed decisions or slow them down. The author remarks that these workarounds arise (a) when there is significant political pressure to accomplish some goal, but (b) some parts of the Constitution's text seems fairly clear in prohibiting people from reaching that goal directly, yet (c) there appear to be other ways of reaching the goal that fit comfortably with the Constitution.

In the essay Tushnet categorises workarounds as fraudulent, contested or true workarounds. True workarounds are methods that achieve results inconsistent with one constitutional provision by taking advantage of the opportunities provided by other constitutional provisions.

True workarounds involve actions that are unquestionably consistent with the Constitution's formal requirements. The author makes the point that the fact that they can readily be characterised as yielding results inconsistent with the Constitution explains why the term "workaround" might have a slightly seedy resonance, a situation that is echoed throughout any discussion of workarounds.

Global vs local

A situation where workarounds may be of especial value is when a case is subject to both national law and international conventions. Article 5 of the Berne Convention for the Protection of Literary and Artistic Works ensures that a foreign author based in a signatory country can claim the same copyright protection as local authors whether or not they enjoy protection in their own country (Porcin 2012). For example, since both the United States and France signed the Berne Convention an American rights-holder whose works are exploited in France can claim the same rights as French rights-holders in France.

In addition to granting protection to foreign authors, the Berne Convention provides for minimum protection standards. Consequently, signatory countries are free to increase copyright protection through any mechanism of their liking. However, this can give rise to some substantial problems.

The author illustrates a number of workarounds which have been developed (in this case specifically for USA/France

agreements) to circumvent the differences in approach at a national level that the international Convention does not specifically address.

Coping with the Covid pandemic

The impact of Covid on working practices in 2020 was immediate as offices, shops and factories had to find ways of continuing their business activities under conditions that were novel, challenging, often changing by Government edict with little prior notice. Workarounds were actively sought, implemented, discarded and adapted and it will be some time before all the implications of Covid on working practices will be fully understood despite the very significant amount of research that has been published.

In the UK, and no doubt in other countries at this time, there was a recognition that the processes of justice had to maintained without compromising the impact on individual citizens. (Tomlinson 2020) looks at just one element of the UK judicial system, the HM Courts and Tribunals Service. This service lies at the core of English judicial processes, with responsibility for providing the supporting administration for a fair, efficient and accessible courts and tribunal system.

The Service had over 17,000 employees and was already in the process of an extensive, expensive, and controversial £1bn digital transformation project. The onset of Covid restrictions in the UK caused a dramatic shift from conventional face-to-face judicial processes to remote hearings in a matter of days. The Service managed this shift with very little notice

and yet being acutely aware of the importance of maintaining compliance with the law in a situation without any previous parallel. The paper records the many different ways lawyers and court officials found ways to workaround the challenges of remote working without compromising legal validity.

Adaptation to organisational process changes

In France over the last two decades there have been some substantial changes in the justice system under which the police operate. These reforms to the justice system had an indirect impact on officers' relationships with their hierarchy and their colleagues. Monties and Gagnon (2022) describe two ways a sense of alienation arose. First, the reform led to rules requiring officers to spend an increasing amount of time on clerical tasks, decreasing time in the field engaged in their preferred activities, such as searching, chasing, or capturing. At the same time, they expressed a loss of trust in their hierarchy, referring to their superiors as 'pen-pushers' who no longer understood the realities of the field.

As an example of how these problems work through to the front line the paper cites the introduction to a training course by an instructor.

"First we're going to show you the official, regulation techniques we're supposed to use when we're facing a non-compliant person or in case of assault. We all learned these gestures in police school. Most of us know by now that these gestures are not effective in real-life situations. So we're going to show you other techniques that are close to the official ones, but

are more effective and appropriate in a real confrontation in the field, so you can protect yourself."

The paper gives a number of similar examples where police officers felt that although the law required them to access a set of rules, these were counter-productive to gaining convictions whilst retaining their pride and individual competence.

In the conclusion to their paper the authors note the importance of conversation if personnel are to accept and integrate changes managers wish to implement, and that managers must be aware of the ways that workarounds and rule-bending practices can help shed light on the resistance that may occur and the identity work it generates.

Workarounds and rule bending

A paper by Bozeman et al (Bozeman, Youtie and Jung 2020) considers the relationship between workarounds and rule bending. It provides a very broad view of both workarounds and rule-bending within the context of university administration without any specific reference to IT systems. The context of the research undertaken by the authors is the workload associated with applying for research grants in US universities, a challenge faced by universities everywhere!

The paper is based on a comprehensive literature review with a particular focus on healthcare, medical and nursing, IT and management, and public administration. Interviews were conducted with 116 academics. The authors make the valuable observation that the literature on workarounds and rule bending comes from different perspectives and reflects

different interests, in large measure due to the nature of the context examined.

The authors differentiate between:

- Rule noncompliance: any instance in which an organisation's employee engages in activities that go against organisational rules. Noncompliant behaviour does not need to be a direct action in violation of rules, it can also entail failing to act at all when action is required by rules.
- Rule breaking: self-conscious noncompliance with a formal rule, by any means, for any reason, including not acting at all when a behaviour is required.
- Rule bending: a form of noncompliance that takes advantage of loopholes in rules or a rule's lack of clarity and therefore the possibilities for multiple interpretations.
- Workarounds: a self-conscious and calculated unsanctioned action taken by an employee to address a perceived shortcoming of the rule with respect to one or more of the employee's objectives (which may or may not be consistent with the rule's objectives)

The authors comment:

"In contrast to rule bending, workaround behavior, by our conceptualization, entails taking specific actions not sanctioned by the rule, typically making adjustments to the rule, with the

intent of serving any of a number of objectives, ranging from personal convenience to helping a client to taking actions perceived to benefit the organization."

They go on to observe:

While workaround behavior is clearly related to rule bending, workarounds are generally more calculated and are less likely to be one-off behaviors. Our concept of workaround requires direct action in pursuit of objectives that the individual perceives as not well served by the rule. These objectives may relate to the organization's intended objectives, but they may also relate to the individual's personal objectives or objectives of stakeholders valued by the individual. Thus, in our usage, workarounds are not just a matter of addressing workflow problems and bottlenecks."

Hybrid processes and workarounds

A significant majority of the published research on workarounds presupposes that the entire process from creation to completion is digital. Despite the wide-scale adoption of IT process support systems many organisations, especially smaller enterprises, struggle with processes where, for some reason, important information is communicated using a hybrid process of paper documents (which may have been created using a computer) and IT systems.

A paper by Mörike (2022) is a very good example, and one that I return to in Chapter 5 because of the ethnographic research methodology adopted by the author. The paper explores in some detail the hierarchies of the company and the

way in which workarounds are used to manage the flow of information, resulting in a reversal of the obvious managerial and operational hierarchies. Another factor is the way in which elements of the physical arrangement of the offices supported or compromised workarounds. The author describes how digital (ERP) tools and the analogue tools (such as walking down a staircase to a different department to validate information) are very closely linked and have been optimised to ensure that the company works as effectively as possible in meeting customer orders.

Although there is a firm-wide IT system this study focuses on the information flows around the organisation and not on any particular lack of ability to make use of the IT systems. This is an important aspect of the research project as so much of the research literature focuses on the process and does not take into account the impact on information quality and veracity, a topic covered in more detail in Chapter 9.

The dark side of workarounds

The purpose of this book is to illustrate the potential benefits and risks from employees developing workarounds with a view to improving their own working environment. There are of course many examples where disaffected employees use workarounds to damage the operations and reputation of the organisation they work for. I have excluded any discussion of this type of workaround.

The bottom line

These are just a few of many examples of where process

changes have been referred to as workarounds. During the course of writing this book I set up a profile on Google Scholar for 'workarounds'. In a typical week around a dozen papers would be presented in the profile, with a split of four on enterprise IT workarounds, four on clinical systems workarounds and four on situations where there was little or no IT involved. The research papers listed below come from a wide range of publications and there could be significant benefits from organisations looking for management solutions to IT workaround issues in account of the experience from these 'non-IT' workarounds. Chapter 3 considers the user experience issues that arise from the complexity of enterprise IT systems.

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3.

ENTERPRISE SYSTEM COMPLEXITY

In this chapter

This chapter provides an introduction to the issues that can arise when implementing and managing large-scale enterprise and healthcare applications. These issues may not be fully appreciated by readers who do not have direct experience with system integration and implementation. The research indicates that workarounds in both systems are a result of a mismatch between the ambitions of the organisation and the ability of employees to make effective use of the systems on a day-by-day basis. Among the challenges faced by employees in making use of enterprise applications are system accessibility and being able to adapt to accommodate neurodiversity.

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Fitness to purpose

When I was working at Logica (a highly successful UK computer systems development consultancy) in the late 1980s there was a very strong emphasis on delivering solutions that were fit for purpose rather than fit to specification, even if this meant difficult discussions with the client and potentially

having to undertake work that could not be billed to the client. The view was taken that client satisfaction was everything and that future business would make up for any short-term reduction in profits.

The core issue was that the specification developed by the client often turned out to be very wide of the mark, especially when it came to defining tasks and processes. Only when the system had been installed and pilot acceptance testing had begun did issues arise from the way that employees used workarounds to improve aspects of task completion that had not surfaced in the initial business process analysis and specification development. It was often the case that workarounds were then devised to ensure that acceptance of the pilot could be achieved but these turned out not to scale when the full implementation was put into operation.

At this point it is important to reflect on what constitutes an enterprise application (EA). These are applications which are in principle available to any employee across the organisation and are managed by the corporate IT department. An individual employee may only have partial access to the application, using certain features that have been deemed appropriate for their role and responsibilities. They are very unlikely to be aware of the full functionality of the application. Much of the research into enterprise application implementation has been on Enterprise Resource Planning (ERP) applications as these tend to be the core platform for an organisation, usually integrating with a range of other more

specialised applications. In a hospital the Electronic Health Record (EHR) application would fulfil the same core purpose.

Putting the enterprise into the enterprise system

In 1998 the American information management consultant Tom Davenport wrote a seminal article in *Harvard Business Review* in which he questioned whether ERP systems were actually mirroring internal processes or was the reality that the processes were being adapted to be able to be implemented with the ERP.

Davenport comments

"In addition to having important strategic implications, enterprise systems also have a direct, and often paradoxical, impact on a company's organization and culture. On the one hand, by providing universal, real-time access to operating and financial data, the systems allow companies to streamline their management structures, creating flatter, more flexible, and more democratic organizations.

On the other hand, they also involve the centralization of control over information and the standardization of processes, which are qualities more consistent with hierarchical, command-and-control organizations with uniform cultures..... Some executives, particularly those in fast-growing high-tech companies, have used enterprise systems to inject more discipline into their organizations. They see the systems as a lever for exerting more management control and imposing more-uniform processes on freewheeling, highly entrepreneurial cultures."

He concludes

"Many chief executives, however, continue to view the installation of an ES as primarily a technological challenge. They push responsibility for it down to their information technology departments. Because of an ES's profound business implications—and, in particular, the risk that the technology itself might undermine a company's strategy—off-loading responsibility to technologists is particularly dangerous. Only a general manager is equipped to act as the mediator between the imperatives of the technology and the imperatives of the business. If the development of an enterprise system is not carefully controlled by management, management may soon find itself under the control of the system."

The evidence from the research literature, and from stories in the news about failures of IT systems, is that these lessons have still not been learned.

The quest for productivity

The majority of enterprise system vendors sell on the promise that adopting their application will enhance productivity. At the same time the CIO is under pressure to improve the productivity of the workforce. A perfect fit? Productivity is a good metric for machines but a very poor metric for employees, especially those engaged in what might be termed knowledge work. It is a metric for outputs and not a metric for outcomes. Quality never comes into the equation.

As this book was being finalised Microsoft announced the launch of its Copilot application which makes extensive use

of the Large Learning Model (LLM) technology developed by OpenAI. (The implications of this for workarounds are considered in Chapter 11.) In the launch post from Microsoft the company states

"GitHub data shows that Copilot promises to unlock productivity for everyone. Among developers who use GitHub Copilot, 88% say they are more productive, 74% say that they can focus on more satisfying work, and 77% say it helps them spend less time searching for information or examples."

No analysis is provided as to whether productivity increases for developers (based on Microsoft internal data) is at all representative for knowledge workers in customer sites.

The problem of using productivity as a metric of success is that there is no agreed definition of productivity and the term itself derives from 'product' which can be characterised and counted. Despite this there is a widespread use by IT systems vendors of the extent to which implementing their technology will improve productivity. From an employee perspective there is inevitably concern that either they will be expected to work even harder in the future or that the implementation will put their continued employment at risk as the organisation uses the promised increase in productivity to reduce the number of employees, who of course represent a significant element of the costs of running the business.

The result is that employees in both IT and the business find themselves under increasing stress.

The pressure is on the IT department to deliver an

implementation or an upgrade as quickly as possible. So long as all the process requirements can be ticked off as met there is no incentive to consider issues about the user experience, which may require additional work to deliver.

Functional and non-functional requirements

When it comes to specifying the requirements for an enterprise IT application the functional requirements are developed by business analysts.

The roles of a business analyst include

- Analysing a business problem or opportunity.
- Undertaking research to understand the context within which an application (or individual process) will be implemented.
- Identifying areas for improvement, exploring options and assessing effects of change and proposing success measures.
- Identifying and elaborating user and business needs to enable effective design, development and testing of services and business change.
- Advising on decisions related to prioritisation and relationships with other applications and processes.

From this work, using well-established techniques, functional specifications can be developed.

Establishing non-functional requirements is much more difficult. These relate to the way in which employees will use

the application, often now referred to as the User Experience (UX). Many of these relate to usability, but this is itself a very broad concept.

A very helpful categorisation of core issues of usability has been developed by Hertzum (2010), setting out what he regards as six 'images' of usability.

- *Universal usability—usability entails embracing the challenge of making systems for everybody to use.*
- *Situational usability—usability is equivalent to the quality-in-use of a system in a specified situation with its users, tasks, and wider context of use.*
- *Perceived usability—usability concerns the user's subjective experience of a system based on his or her interaction with it.*
- *Hedonic usability—usability is about joy of use rather than ease of use, task accomplishment, and freedom of discomfort.*
- *Organisational usability—usability implies groups of people collaborating in an organisational setting.*
- *Cultural usability—usability takes on different meanings depending on the users' cultural background.*

This categorisation is important in moving the discussion away from a mechanistic approach to conformation with (in particular) the Web Accessibility Initiative guidelines.

Meeting user expectations.

Over the last decade the usability of web applications has increased significantly, led by the research conducted by consultancy companies such as the Nielsen Norman Group and MeasuringU. The Web Accessibility Guidelines have been developed through the W3C process in cooperation with individuals and organisations around the world, with a goal of providing a single shared standard for web content accessibility that meets the needs of individuals, organisations, and governments internationally. The standards recognise that web applications are used by people with a wide range of physical and cognitive disabilities.

WCAG 2.0 was published in December 2008 and this was followed in June 2018 by the publication of WCAG 2.1. The WCAG 2.2 Draft is scheduled to be finalised by May 2023.

The Guidelines and Success Criteria are organised around the following four principles, which lay the foundation necessary for anyone to access and use Web content. The core requirements are

Perceivable – information and user interface components must be presentable to users in ways they can perceive. This means that users must be able to perceive the information being presented (it can't be invisible to all of their senses).

Operable – user interface components and navigation must be operable. This means that users must be able to operate the interface (the interface cannot require interaction that a user cannot perform).

Understandable – information and the operation of the

user interface must be understandable. This means that users must be able to understand the information as well as the operation of the user interface (the content or operation cannot be beyond their understanding).

Robust – content must be robust enough that it can be interpreted reliably by a wide variety of user agents, including assistive technologies. This means that users must be able to access the content as technologies advance (as technologies and user agents evolve, the content should remain accessible).

Work on WCAG 3.0 is in progress but the standard is unlikely to be published for several years.

WCAG 2.0 is approved as an ISO standard: ISO/IEC 40500:2012.

The ISO also publishes ISO/IEC 25010:2011(en) which has the sub-title 'Systems and software engineering — Systems and software Quality Requirements and Evaluation (SQuaRE) — System and software quality models'. This standard is concerned with quality and not accessibility.

According to the ISO web site ISO/IEC 25010:2011 defines:

1. *A quality in use model composed of five characteristics (some of which are further subdivided into sub-characteristics) that relate to the outcome of interaction when a product is used in a particular context of use. This system model is applicable to the complete human-computer system, including both computer systems in use*

and software products in use.

2. *A product quality model composed of eight characteristics (which are further subdivided into sub-characteristics) that relate to static properties of software and dynamic properties of the computer system. The model is applicable to both computer systems and software products.*

The problem that organisations face is that it is very difficult to evaluate the extent to which non-functional requirements are being met. It is not possible to undertake user experience research until the application is very close to implementation, so close that fundamental changes cannot be made without incurring substantial additional costs and delaying the implementation. User experience testing on pilot or minimum viable product versions may well not scale. In addition the challenges being faced by acting as a systems integrator in migrating data from one system to another may not be apparent for some time.

Accommodating neurodivergent employees

The concept of neurodiversity dates back to the late 1990s as a way of describing a wide range of cognitive conditions such as autism, dyslexia and Attention Deficit Hyperactivity Disorder (ADHD). These are all 'spectrum' conditions and are often very difficult for both the person and the clinician/psychologist to identify. There are no remedial treatments for any of these conditions. People with these conditions find workarounds in both daily life and in the workplace in order to

achieve as good a personal outcome as possible. We can gauge to a limited extent the problems faced by employees who are blind, colour-blind or have conditions that affect the way in which they can use a keyboard, touch screen or a mouse. There is no way in which we can appreciate the challenges faced by employees with a neurodivergent condition. The language of neurodiversity and neurodivergent conditions needs to be accommodated with care.

The work on accessibility often does not go far enough in ensuring that employees with a neurodivergent condition have an appropriate level of support in the workplace. As just one example, employees with dyslexia often benefit from being able to define a specific font that they find improves their level of readability, and also the background colour to the computer screen. These adaptions are often very difficult to implement on enterprise applications and it is not uncommon for an employee to have to reset their preferences each time they use the application (Churchill 2021).

Where an employee resorts to a workaround to accommodate their particular neurodivergent condition (or indeed, conditions) they may be even more reluctant to disclose the workaround they have adopted in case it leads to a more general discussion about the impact of their neurodivergence on their ability to undertake the roles and responsibilities that their position requires.

There is very little published research on the range of workarounds adopted specifically by employees with a

neurodivergent condition in an enterprise setting. Das (2021) examines the issues arising in the case of neurodivergent employees working remotely and this gives an indication of the issues they would experience in an on-site situation.

Enterprise system implementation challenges

The implementation of enterprise applications is a major challenge for organisations of any size. Often organisations will outsource much of the implementation work to specialist system implementation companies, especially where the application is new to the organisation and so there is little or no internal experience to call on.

These challenges can be broadly categorised as

1. **Stakeholder expectations and support**. The business case for an ES usually involves the ability to integrate a range of different functions. Within the business these functions were owned by different senior managers, often at Board level. Gaining agreement on the expectations, and how the budget would be set and managed, turned out to be immensely time-consuming and fraught with internal power struggles.
2. **Project management**. ES implementations entail multiple phases: discovery and planning, design, development, data migration, testing, deployment, support and post-launch updates. Each phase resulting in a number of critical tasks, and all elements need to stay on track, which requires meticulous project

management. Additionally, successful EA implementations required participation from all the groups that will be involved in developing and using the system. That can be incredibly challenging, because each department is juggling its ES project responsibilities with multiple other priorities.

3. **Business as usual**. Another aspect of project management is that business-as-usual has to be maintained. This can put extreme pressure on employees who may be having to use two different systems at the same time, one of which may not be fully functionable.
4. **Project planning**. Organisations often underestimated the time and budget necessary for a successful implementation because they had little prior experience of doing so. One of the most common causes of budget overruns was scope creep—when a business adds capabilities or features to the system that weren't part of the original plan—and another is underestimating staffing needs.
5. **Data integration**. A key step in ES implementation is data migration, which typically involves moving data from multiple older systems into the ES database. The information may be spread far and wide across the organisation, buried in accounting systems, department-specific applications, and spreadsheets, with invariably different approaches being taken by individual subsidiaries and geographic locations.

6. **Data quality**. Because multiple departments interact with the same customers, products and orders, organisations often have duplicate versions of the same information in their systems. The information may be stored in different formats; there may be inconsistencies, like in addresses or name spellings; some information may be inaccurate; and it may include obsolete information such as customers or suppliers that have since gone out of business. In multi-national companies the application may need to work in multiple languages and accommodate local regulations on data privacy and on auditing.
7. **Change management**. An ES implementation typically means overhauling business processes to take advantage of the efficiency and productivity improvements possible with the new solution. Initial pilot testing may show that a process has not been well defined but making a change may well require other linked processes to be changed.
8. **Post implementation**. Moreover, the solution needed to evolve to support new business demands and technology. The project team needed to continue to manage the project after deployment, fixing issues and supporting new requirements as they come up. If the project team had been largely staffed by external consultants, either from the software vendor or an application partner, then much of the knowledge of the

design of the system may not be immediately accessible to the organisation.

Electronic Health Record system implementation.

The starting point for EHR systems was a proposal in 1968 by Lawrence Weed, an American clinician, for a Problem Oriented Medical Record. This was the catalyst in the development of the "SOAP" note, an acronym based on Subjective, Objective, Assessment and Plan. An element of this development was the evolution of an encounter as being a communication between two or more individuals, at least one of whom is a member of the health care team. The communication may be direct such as a face to face or telephone conversation with the patient, or indirect such as a letter or report received from the hospital.

Electronic Health Record systems emerged gradually in the USA, where the widespread use of private medicine meant that there was a need to track patient treatments so that the patient could be billed. In Europe medical treatment was always free at the point of delivery. With the advent of web-based applications and the development of systems that could be used in general practice EHR system design was extended to track the history of a patient.

An important catalyst to growth was the creation by President George W. Bush of the Office of the National Coordinator for Health Information Technology, which

outlined a plan to ensure that most Americans had electronic health records within the next ten years.

Additionally, these records were designed for healthcare providers to:

- Share information privately and securely with the patient's authorisation.
- Help health care quality, prevent medical errors and reduce paper work.
- Improve administrative efficiencies and health care quality.

In the United States these systems work under HIPAA, a set of federal regulatory standards that outline the lawful use and disclosure of protected health information in the United States. HIPAA compliance is regulated by the Department of Health and Human Services (HHS) and enforced by the Office for Civil Rights (OCR).

To match the implementation challenges of EA systems the challenges with EHR applications include

1. **Cost of implementation**. Although hospitals are accustomed to making a significant expenditure in diagnostic and surgical equipment IT system investment has always been a challenge, even in the largely privatised US medical system. The benefits are also far less immediate than in diagnosis and treatment so making a

business case for the investment is very difficult.

2. **Data migration**. A vital element of the implementation of an EHR is the conversion of a very significant archive of patient records, with no easy agreement on how far back in time the records should go. Even after initial implementation there is a substantial task to validate the records.
3. **Staff training**. Hospitals and clinics invariably find that staffing is a major concern in delivering high quality health care. There is also never a 'down time' in a clinical setting where training can be undertaken – hospitals work on a 24/7 basis so time to spend on training is very difficult to arrange, especially for more senior staff who are on-call throughout their working day.
4. **Poor usability**. ERP system vendors have considerable experience in the development of enterprise-wide systems. That is not the case in EHR application development where potential customers will have only limited, if any, prior experience with large-scale patient critical systems and the inevitable issues of usability.
5. **Staff resistance**. Poor usability inevitably causes staff at all levels to question whether the investment is going to improve patient outcomes, and can result in shadow systems (often manual) being maintained because of concerns about the efficacy of the EHR.
6. **Data privacy**. Another major challenge of EHR is the data privacy concerns of the patient and provider

community. The stakeholders often voice concerns over the risk of data leakage due to a natural disaster or a cyber attack. The federal rule has imposed a national policy to protect the confidentiality of personal health data. In case of a security breach, the organisation may get into a legal hassle and have to spend millions of dollars to settle the dispute. Hence, it becomes a major responsibility of the provider to ensure the data security of the EHR systems.

7. **Technical skills availability**. This is one of the EHR implementation challenges often faced by small clinical establishments and private health practitioners. They may not have the required hardware to support the EHR solution. nor the experience and expertise in implementation. It is a huge expense to build an in-house team with proper staff with adequate expertise *and* to buy hardware. This is a common reason for small and mid-sized healthcare providers delaying the EHR implementation process.
8. **Lack of proper planning**. EHR implementation brings in a cultural change in the organisation rather than a mere technological upgrade. Hence, the change in management aspects of EHR implementation become a real challenge. It needs to be strategically planned and commitment is expected from all stakeholders. Not having a structuralised plan for EHR implementation can lead to data breaches and cybersecurity threats to

patient information. The successful implementation and sustainability of the EHR systems can be a far-fetched dream without a great amount of planning involved.

EA and EHR comparisons

The table below sets out an inevitably generalised comparison of the extent to which there are common issues with ERP (and most other enterprise scale applications) and EHR and where there are some significant differences.

EA	EHR
Potentially global with implications for language support.	Local/regional and no significant requirement for language support.
Builds on/integrates with existing IT infrastructures.	Replaces multiple (mainly paper-based) internal systems on multiple platforms.
Limited data privacy issues, primarily about the use of data logging.	Every record contains sensitive personal information.
Low-level workarounds very unlikely to put the organisation at risk.	Any workaround could prejudice clinical outcomes.
Focused on data management with entry validation.	Extensive reliance on free text without validation.
IT team members will have previous experience of specification and implementation.	IT teams will have no previous experience of specification and implementation, and will need to depend on the vendor for implementation support.
Limited requirement to aggregate data across multiple processes.	Important to be able to aggregate data and information.
Time pressure as a result of enhancing personal performance.	Time pressure from the need to achieve the optimum patient outcomes.
Limited external audit on process compliance other than for financial records.	Significant internal and external audits.
Process connections are well defined.	Processes are patient/clinical area specific.

Users will have certified training on the applications.	Limited training available because of pressure on staff availability
Managers have zero awareness and access to academic research.	Senior clinical managers will be familiar with academic research and will have access to it.
Rarely any third party users.	Third party access for primary care centres is important.
Teams are horizontal within a department (e.g. accounts, logistics).	Teams are vertical from nursing to consultant and vary from patient to patient.
Often a requirement to support local languages and practices.	Applications are usually country-specific.
No sharing of best practice between organisations.	More likely to be sharing of outcomes, at least within a Trust.
Because of the process management compliance failures can be detected by business process management applications.	The wide range of processes, mostly patient/clinical outcome dependent, make automated discovery much less effective.
No ethical issues.	Very significant ethical issues.
Workarounds seen as disruptive and unhelpful to the business.	Workarounds seen as the basis for innovation in clinical delivery.

The fundamental difference is that in the case of enterprise IT systems there is very unlikely to be any serious impact on employees and customers. With EHR systems a patient's life expectancy is at risk and members of the clinical team could be found to have failed to provide the expected level of professional competence.

Enterprise application integration

Another common TLA in the IT sector is Enterprise Application Integration (EAI). The objective of the business is to integrate as many of its systems as possible into a single application, often using third-party applications.

Organisations can be at different levels of EAI, from applications existing separately to full integration where all applications share common data and workflows. More realistically, most will fall somewhere in between, with some applications working together and others not.

There are three core approaches to achieving a successful EAI solution.

Point-to-point integration. Data is taken from one source, perhaps reformatted, and then ingested by the next application. This solution does not scale to situations where there is a sequence of processes, each of which involves some degree of reformatting of the initial data.

Hub-and-spoke integration. To overcome the process sequence issues it is also possible to use a hub-and-spoke approach to handle the reformatting and this can reduce latency delays that often occur with the point-to-point integration.

Enterprise service bus integration. This is an evolution of hub-and-spoke design in which all the applications use a set of standards to send and receive data or workflows. This can speed the integration and application process but requires very careful initial specification.

Whichever approach is chosen the application complexity increases significantly, and problems can arise if the applications are from multiple vendors. When the solution fails to meet expectations working out what is causing the problems and who should own the solution is far from easy.

Another issue is that the user interface may well be managed by the EAI solution and that means that employees who may be able to use each application successfully now find they have to learn a new user interface which may lack some of the functionality of the individual systems. The complexity of the integration process may well mean that changes to the user interface as a result of user feedback are difficult to undertake. The end result is that the quest for 'ease of use' through enterprise systems integration is offset by the lack of usability of the integrated system, again forcing employees to develop workarounds.

Psychological safety

The concept of employee psychological safety dates back to the 1950s but now has a high profile largely from the challenges that employees faced when adapting to remote working as a result of the Covid pandemic, and the resultant loss of 1-on-1 personal interaction to discuss workplace issues with colleagues and managers.

An influential paper on these issues was published in 2003 (Baer and Friese 2003) in which the authors argued that process innovations, defined as deliberate and new organisational attempts to change production and service

processes, need to be accompanied by climates that complement the adoption and implementation of such innovations.

Process innovations = workarounds!

This paper goes to the heart of the matter when it comes to taking advantage of workarounds, and shadow IT, to improve process performance and personal recognition. As of the time of writing this book the paper had been cited 2344 times, which indicates both the value of this research and the scale of subsequent research. The most recent paper on this topic by Edmonson and Bransby (2023) provides a comprehensive overview.

The important point about psychological safety is that a lack of it creates a barrier to any sharing of a workaround or shadow IT for fear of recrimination from colleagues, managers and the organisation.

Global vs local

Enterprise applications are often implemented on a multi-country basis. Adaptation of these applications for other countries requires significant local knowledge. One of the earliest case studies (Soh et al 2000) of an enterprise application focuses on the extent to which these local adaptations were a source of friction among employees. There are also challenges in training employees in the use of these applications because of the need to support this on site, and perhaps to provide some or all of the training in a local language.

At one point in my career I was working as a sub-contractor to a US IT systems consultancy on an ERP implementation in one of the Gulf states. The implementation team were mainly American (who worked with US MM/DD date formats on all project documents), the stakeholders were nationals of the country, most of the middle level managers were British or Australian and the employees making use of the system were also nationals of the country but often had a very limited command of English and no prior experience of working with large-scale enterprise applications. This resulted in some interesting project meetings!

The bottom line

The implementation and management of large scale enterprise applications is very challenging, and is often a collaborative project between the organisation, the application vendor and a specialised systems integration company. Because of the technical challenges of the implementation (and subsequent upgrades) the requirements of employees for an application that they can use effectively with a minimal amount of training are often overlooked, especially as they may only become obvious when the technical implementation is completed. Much of the academic research into workarounds has focused on defining what characterises a workaround, and this is the subject of Chapter 4.

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4.

A CHRONOLOGY OF DEFINITIONS

In this chapter

Over the last two decades there has been a substantial amount of research into developing definitions of workarounds and shadow IT. These definitions also support the categorisation of workarounds and provide a basis for discovering their existence and for identifying what actions should be taken to incorporate the governance of workarounds and shadow IT into an organisational IT strategy. This chapter has a chronological structure, initially considering research published between 1986 and 2010. By 2010 process data logging applications that enabled organisations to track the way in which employees were progressing through a process were becoming available. This is reflected in research after 2010 when data from AI and machine learning applications started to become available.

Defining 'process'

The dictionary definitions in Chapter 1 do not reflect the complexity of the concept of a workaround. It is quite clear from the examples in Chapter 1 and Chapter 2 that the word

can be interpreted in many ways. When it comes to workarounds in the organisation, if there is not a clear definition of what a workaround could be then it is not possible to consider how they can be discovered or to reach a decision on what actions should be taken to deal with them.

Before considering definitions of workarounds it is important to consider the definition of a process. A process is generally regarded as a series of actions that lead to a defined outcome. The process may not necessarily be linear, in that there could be branches that accommodate a specific action. For example, in processing an order it could be that if the order is in excess of a specified amount there has to be a branch for a specific authorisation for the order before returning to the core process. Incidentally the first definition of 'process' as a linear set of actions dates back to 1368 and the promulgation of a Statute for the Observance of the Due Process of Law.

This definition of a process works well for a largely data-rich process but not for what is often regarded as knowledge work. The objective here might be an assessment of a market opportunity. There may well be a procedure for preparing this assessment but with considerable variations in who is involved in the procedure (it might vary by product, country and whether the product is just an upgrade or completely new) and the schedule for completing the stages. Once a process is started it would be unusual for it to be halted or cancelled. In the case of a market opportunity report the decision might be taken to put a temporary hold on the preparation of the

document, perhaps until such time as a new marketing manager for the product had been recruited. The implications of process versus procedure on the discovery of workarounds are considered in Chapter 5.

A considerable amount of academic research has been undertaken into defining, and in particular categorising, workarounds. The chronology of this research is a useful approach to understanding how the topics and workarounds, including shadow IT, have emerged over the last four decades. The periods covered are 1986-2010 and 2011-2023.

Research 1986 – 2010

The process of defining workarounds started with the PhD thesis of Leslie Gasser at the University of Southern California in the period from 1981 to 1984. In a paper based on his thesis Gasser (1986) considered the way in which computing activity is coordinated through numerous commitments among actors to carry out task chains that deliver products of a particular type, in a particular time, for a particular cost. He noted that performance of each task, and the fulfilment of individual commitments, is contingent upon the organisation of the work of numerous other actors (what Gasser refers to as the production lattice). Each task in a production lattice is shaped by the arrangement of the work situation in which it occurs. The orderly flow of work depends upon the consistent alignment of resources and commitments in the workplace.

This is an important observation because there is a tendency to consider a single workaround and not consider whether the

adoption of this workaround has implications for successive elements of the process and the eventual outcome.

Gasser defines the concept of 'resource slip' as the undersupply or qualitative misalignment of resources needed or expected for carrying out a task. Slip may occur in any resource dimensions in the work situation, such as when there is too little time, technology, budget, attention, etc., or when the quality of resources is inappropriate. The author suggests that there are three strategies for accommodation to computing slip: fitting, augmenting, and working around.

Gasser goes on to define working around as intentionally using computing in ways for which it was not designed or avoiding its use and relying on an alternative means of accomplishing work.

In the conclusion to his paper he writes

"This research has several implications for designers, implementers, and managers of systems. Although we need more research to identify the distribution and patterns of system workarounds and other articulation work, it is clear from our study that implementers and maintainers must focus attention on the institutional arrangements of system use in order to make systems more maintainable and to assure that implementation goals are met. Users find difficulties fixing problems when there is conflict between aspects of their own work situations and those of other people involved in repair."

Gasser's paper has been cited over 750 times (according to Google Scholar) which for a paper written in the

comparatively early stages of enterprise-wide information technology adoption is remarkable and gives a sense of the scale of the research that has been published over the last four decades.

Although Gasser is often quoted as providing a definition of workaround in the context of IT systems the papers by Suchman (1983) and by Gerson and Star (1986) should also be considered because they start to address what might be regarded as the underlying issues of managing IT processes in the organisation, especially in an office setting.

There were very few papers on workarounds and shadow IT published in the 1990s, but the level of attention increased from 2005 onwards. Morath and Turnbull (2005) characterise health care professionals as masters of workarounds, recognising how common such practices had become in health care contexts even though this was in the very early stages of the deployment of Electronic Health Record (EHR) applications.

Boudreau and Robey (2005) report an interpretive case study of an ERP system after its implementation in a large government agency. Despite the transformation agenda accompanying the new system, users initially chose to avoid using it as much as possible (inertia) and later to work around system constraints in unintended ways (reinvention). This is one of the earliest ERP case studies and although the authors do not provide any specific definition of a workaround their research is cited in over 1400 subsequent papers. As with the

papers from Gasser and Alter this is another strong indication of the scale of research, and in this particular case the value of what was one of the earliest research projects into ERP implementation.

Although Pollock (2005) does not set out to develop a definition of a workaround his paper is important in identifying that prior research had not considered in any depth the reasons for workarounds being developed.

Ferneley and Sobreperez (2006) provide a critical assessment of the comparatively limited number of research studies that had been published, observing that most tended to resolve towards a binary approach in which workarounds were either of value or presented a challenge to the organisation. Taking an initial assumption of compliance (namely that the user will acquiesce to the system's prescribed function and form regardless of its effectiveness or suitability) the authors propose that a range of motives may move the user from compliance towards either positive or negative resistance, the intersection between positive and negative resistance illustrates that from the differing perspectives of various stakeholders an occurrence of resistance may be viewed positively or negatively.

Houghton and Kerr (2006 and 2007) propose a definition of a feral information system as an information system that is developed by individuals or groups of employees to help them with their work, but is not condoned by management nor is part of the corporation's accepted IT infrastructure. This

definition is more in line with the concept that emerged a few years later of shadow IT.

Halbestlaben (2008) comments that despite their widespread acknowledgment by health care professionals and common mention in the health care literature there is virtually no research concerning the consequences of workarounds for health care professionals. In a later paper (2010) he positions workarounds as a contributing factor in the occurrence of occupational injuries.

Research 2011 – 2023

The level of interest in workarounds and shadow IT increased substantially from 2010 onwards. It is noteworthy that from around this date the Gartner Group (a leading IT consulting firm) was raising the profile and benefits of business process management applications.

The development of a definition for shadow IT is usually credited to Rentrop and Zimmerman (2012) even though the term was in fairly common use by that time. There is an interesting transition around this time from 'shadow IT' to 'Shadow IT' as a means of identifying it as a significant challenge for IT managers. Klotz (Klotz et al 2019) presents a comprehensive review of the literature on Shadow IT.

A very significant contribution to the issues arising from workarounds and how these could be detected by some form of IT diagnostic application was made by Outmazgin in 2013, with a revised version of the paper appearing in 2016. The 2013 paper reports on five case studies of workarounds in

organisations of different sizes and lines of business, but with common processes. From a qualitative analysis of 25 interviews interviews six generic types of workarounds were identified together with situational factors that characterise each of these types.

The six generic types were

- Type A – Bypass of process parts.
- Type B – Selecting an entity instance that fits a preferable path.
- Type C – Post factum information changes.
- Type D – Incompliance to role definition.
- Type E – Fictitious entity instances.
- Type F – Separation of the actual process from the reported one.

The research is extended in the 2016 paper to assess the extent to which each of these types can be tracked by process log analysis.

A very detailed critique of prior research was undertaken by Eszter van der Schaft–Bartis (2013) in her PhD thesis from the Corvinus University, Budapest. The thesis includes a bibliography of 250 papers and reports. The chronology highlights the lack of research into IT-related workarounds in the period from 1986 to the time of her research for her thesis. An important contribution made in the thesis is an

assessment of the benefits and challenges of a range of research methodologies.

The definition offered by Schaft-Bartis in her thesis is

"Workarounds are routines existing next to the computer system: complementing, supplementing or bypassing activities which are not planned and which users exert in order to fulfil their work tasks"

At the same time as Bartiz was working on her PhD thesis Steve Alter was developing a framework for workarounds. (Alter 2014). The introduction to the paper is of considerable value and stands the test of time. Currently it is cited in 442 subsequent papers and has had a very significant impact on workarounds definition and workarounds in general.

The definition of a workaround that Alter developed from his very thorough analysis of research published during the period from Gasser's paper in 1986 up to around 2014 is

"A workaround is a goal-driven adaptation, improvisation, or other change to one or more aspects of an existing work system in order to overcome, bypass, or minimize the impact of obstacles, exceptions, anomalies, mishaps, established practices, management expectations, or structural constraints that are perceived as preventing that work system or its participants from achieving a desired level of efficiency, effectiveness, or other organizational or personal goals."

In his paper Alter compares and contrasts previous definitions with his own and goes on to map out a significant

number of aspects of the development, impact and consequences of workarounds.

In a review paper published in 2016, twenty years after Gasser's seminal paper, Roder (2016) highlighted a lack of depth in the research into workarounds that had been conducted so far. This paper is notable for two important reasons. The first is that the authors provide a table of the outcomes of 84 research papers set out under nine features, such as whether the research was conceptual or based on case studies, and the type of workarounds that were identified. The second is that the authors also set out an ontology of workarounds. This includes 'punishment' and 'probability of punishment' which to this author seem out of place in a business context.

Ejnefnall and Agerfalk (2019) conducted a very detailed review of 110 research papers on the definitions of workarounds, paying especial attention to the research methodology used, and the extent to which the research paper was based on empirical research or on a critical review of the literature.

The authors comment that they found that studies examined various empirical contexts that differed according to company size (small to multinational companies) and industry type (private companies and public companies, such as hospitals and government agencies). However they found large differences in the number of studies connected to different theoretical insights and thus, some insights necessarily

emerged from fewer contexts since fewer total studies identified them.

They found that only three theoretical insights about workarounds attracted relatively considerable research attention in relation to the number of studies:

- workarounds as resulting from organisational-system misfit
- workarounds as resulting from conflict between top-down pressures and bottom-up constraints, and
- workarounds as connected to resistance.

The authors note that of the 84 papers that they reviewed 24 appeared in conference proceedings. They comment that because papers in conference proceedings do not undergo as rigorous a review process as journal papers and have a much shorter length, they often do not thoroughly describe their data collection, analysis, and results.

The paper includes a very useful table that for each paper reviewed whether there was an empirical basis to the paper.

Wolf and Beverungen (2019) build on Alter (2014) and focus on the extent to which an individual workaround may have a wider impact in an organisation, either on a subsequent stage of a process or as a model for other employees to adopt when developing their own workarounds.

The authors expanded the coding scheme proposed by Alter, renaming

- 'phenomena' into 'trigger'
- 'perspectives' into 'perception'
- 'organizational challenges and dilemmas' into 'challenges and opportunities to ensure appropriate mapping of the data'.

The authors also restructured and summarised the triggers (formerly phenomena) associated with workarounds. Although they adopted Alter's 'technological misfit' (Alter, 2014) (i.e., constraints regarding the functionality of an IT artefact and activity performance on an individual), they added 'organizational misfit' (i.e., a discrepancy between the defined process and the actual performance), and 'strategic misfit' (i.e., a discrepancy of an IT artefact with an organisation's strategy and operations) as new triggers for workarounds. The justification for making these changes was because the authors considered that many workarounds have organisational causes that lay outside of Alter's Theory of Workarounds.

Blijleven and his colleagues (Blijleven, Koelemeijer and Jaspers 2019) examine the management of workarounds in electronic health care systems. As set out in Chapter 3 there are some differences between ERP and EHR applications but both are examples of complex enterprise applications where users may need to resort to workarounds.

The team developed the Sociotechnical Electronic Heath Care Record Workaround Analysis framework, under the

SEWA acronym. This framework looks at the inter-relationships between Persons, Tasks, the EHR System, EHR Workarounds, the Physical Environment, and the Organisation, and considers the Outcomes in Scope and Impact. The model is based on Systems Engineering Initiative for Patient Safety (SEIPS). They propose that four distinct attributes identify EHR workarounds.

- Cascading versus non-cascading workarounds
- Avoidable versus unavoidable workarounds
- Anticipated versus unanticipated workarounds
- Incidental versus routinised workarounds

In a summary of the paper the authors comment that EHR workarounds are not solely the result of technical EHR-related factors but also of human, organisation and task-related factors.

The SEWA framework was subject to a review published in 2022 (Blijleven, Hoxda and Jaspers 2022). A scoping literature review was performed on studies related to EHR workarounds published between 2010 and 2021. A total of 737 studies were retrieved, of which 62 (8.4%) were included in the final analysis.

A novel approach to building on Alter's work has been undertaken by Wibisono (2019). The top most cited papers and the top most recent papers are compared within the framework of Alter's Theory of Workarounds. This has the

benefit of creating a very useful list of 43 papers as a basis for a literature search. In a subsequent paper (2022) the concept of organisational routines is used to classify workarounds.

A paper from Willermark (2022) is of importance because of the four case studies incorporated into the paper from the public sector, a group of cancer rehabilitation nurses and resident physicians in a hospital, a group of primary school teachers and a group of municipal communicators. It has the merit of being a very concise approach to categorisation of workarounds in Practice of Flexibility, Practice of Efficiency and Practice of Responsibility.

The most recent review of the literature come from Einfjall et al (2023) in which the authors update their 2019 paper. They provide a very useful tabular analysis by research themes of both the research cited in their 2019 paper and research published from 2019 to 2022,

The table below provides a chronological list of the research papers that include a good review of the literature at the time of publication

Author and date	References
Boudreau 2005	56
Halbesleben 2008	54
Schaft-Bartis 2013	230
Alter 2014	130
Roder 2016	102
Blijleven 2019	42
Wibisono 2019	42
Einefjall 2019	120
Wolf 2019	45
Beerepont 2021	270
Willermark 2022	45
Wibisono 2022	50
Blijleven 2022	78
Einefjall 2023	85

The bottom line

The quest for a definitive definition and sub-categorisation of workarounds (including shadow IT) continues, and may do so for some time to come. Many of the studies considered in this chapter are based either totally on reviews of the literature or a literature review and some generally small-scale case studies. The focus is on categorisation of the types of workarounds but in general little attention is paid to defining

why employees develop workarounds. Among these reasons are the challenges faced by employees who have neurodiverse conditions and need to make adaptions to be able to use IT applications which have not taken their requirements into account at the development stage. Overall Alter's analysis in 2014 remains a very important framework for the consideration of why workarounds are developed. By their nature workarounds tend to be invisible to the organisation. Chapter 5 sets out the potential options to discover the scale and purpose of workarounds.

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5.

MAKING THE INVISIBLE VISIBLE

In this chapter

Employees who have developed workarounds may well have no incentive to disclose them, especially if the ethos of the organisation is to see the use of workarounds as being an example of resistance to change. In this chapter the use of both qualitative and quantitative approaches to the discovery of the existence, scale, value and potential risk are considered. Applications that log process steps to highlight potential workarounds in use have limitations when it comes to workarounds for procedures.

Can you count workarounds?

How many workarounds are there to discover? Almost certainly more than you might imagine. In the many case studies that have been undertaken usually only a small number of employees are interviewed, a very small percentage of the total number of employees. The choice of employees to interview is made by the organisation, not the research team, so the end result is in effect a somewhat random sample. Yet as the interviews proceed most, if not all, of the interviewees

have a story to tell. There is a paradox in that until there is a reasonably clear understanding of the scale of workarounds it is not possible to decide on the balance between the two approaches. It could be that ten workarounds are discovered out of perhaps hundreds that might be in active use. There is a parallel situation in search when seeking a complete recall of all relevant documents; there is no way of knowing how many there actually are to assess whether the search has been successful.

However it is not just a question of how many. In your organisation there might be just a few but they are being used in processes which could have a serious impact on performance and reputation if the workaround is inappropriate. The number of workarounds is also subject to rapid change as new systems are introduced and older systems are upgraded. Should the attention only be to making the best of the investment in a new application and overlook workarounds in legacy applications that might be generating significant technical debt and corporate risk?

The discovery process also has to be linked to a remedial process. If the decision is taken that a particular workaround needs to be eliminated then what is going to take its place? Nothing will annoy an employee more than being 'found out', criticised by their manager and told that using the designed system is mandatory.

Making the invisible visible

There are many challenges to overcome when embarking on

a project to discover workarounds within an organisation. For a start there are two quite distinct discovery methodologies, each of which has value. The first is to use data logging to create a quantitative assessment of the incidence of workarounds at an individual process level. The second is to use an ethnographic approach to understand the factors affecting the development and adoption of workarounds at an employee level. In practice it needs a blend of both but determining the balance between the approaches is difficult. There are no reliable independent surveys of the extent of workarounds in organisations but as discussed in Chapter 7 there are surveys of shadow IT adoption. These surveys indicate that the use of shadow IT is widespread, and after all shadow IT is arguably a workaround.

The initial challenge is to decide which applications and which processes to explore for workarounds given the range of applications in use in an organisation. A report released in 2021 by Productiv, a provider of applications to identify shadow IT, indicates that within their SaaS (Software As A Service) library large enterprises average 364 applications, while small businesses average a portfolio of 242 applications. Productiv analysed 107 categories of applications in its survey and found that organisations typically had 17 categories with five or more tools in critical categories like project management, sharing and storage, and messaging. It is not surprising that enterprise search logs show a high incidence of employees looking for applications by name or by function.

Concur is the brand name of an SAP expenses management application and often occurs well up the list of most searched terms on an enterprise search log. It may only be used monthly so employees find it difficult to remember how to locate a very important (to them!) application which is used relatively infrequently.

To identify a workaround in a process it is first necessary to have a well documented description of the process and the potential variations in how it can be used. There has been a substantial amount of research into business maturity models (Tarhan 2016) but in practice a wide range of models are in use. The Microsoft Model for Microsoft 365 Business Process Maturity is an example. The question is at what level of maturity can a data logging application provide a grounded basis for deciding that a workaround is being used?

Despite the number of processes supported by IT applications there are also a substantial number of much more flexible and poorly documented procedures. An example might be the compilation of a user manual for a high technology product which will go through many iterations and involved multiple review processes, probably managed by circulation of each version attached to an email.

A paper by Beverungen et al (2021) sets out seven paradoxes of business process management in what they describe as a hyperconnected world, mentioning (for example) the role played by smart personal devices.

Design science project framework

A number of studies into workarounds have adopted what is referred to as design science research model to frame the investigation and the analysis of the outcomes. From a workaround perspective the benefit of using this model is that it starts with identifying requirements and then moves on to designing the solution. Although this approach has been developed and tested within academic research the steps could also be of value to an organisation in setting up a research project to assess the prevalence of workarounds.

Pello (2018) provides an introduction to design science research which is built around a seven-step process.

To quote from the author's commentary

"First, carry out end-user researchto gain insights and discover the active and latent needs and values of the users, and understand the factors of behaviour (what do people think, why they do what they do or do not do what they are supposed to do, what are their attitudes towards the problem, their belief systems; and cultural, political, legislative and social context; etc.).

Second, define clear objectives and restrictionsbased on the findings (does the solution need to be a new physical object, label; or an intangible service or a process according to which something is made easier; etc.).

Third, using different techniques (like brainstorming, experience sketching, feature trees, etc.) gather different ideasfor the solution.

Fourth, filter out the viable and feasible ideasfor testing (evaluate the ideas).

Fifth, test the chosen ideas with the end-users to find out the best solution (do the end-users understand the solution or not; can they use it without extra instructions; etc.).

Sixth, iterate by reviewing, refining and retestingthe solution in order to get to the best possible solution that can be generalised.

Seventh, compare the solution with theories, develop on the existing theories, generalise the outcomeand share the knowledge with appropriate audiences (people, companies and policy makers).”

Ethnographic research

Although organisations may undertake employee satisfaction surveys, the lack of expertise in writing research surveys (as distinct from employee satisfaction/opinion surveys) is often very noticeable. There is usually even less experience with interviews and the associated elements of ethnographic research. Ethnography is a social studies research methodology based on observing the behaviour of the participants in a given social situation and also understanding the group members’ own interpretation of this behaviour. The methodology dates back to the mid-1740s.

Madden (2017) provides a good introduction to ethnographic research.

Although ethnographic research can be of great value in understanding why certain workarounds have been introduced, the research process needs to be developed, managed and analysed with considerable care to ensure that the right blend of techniques is adopted and adapted as

evidence is collected. It is not just a question of circulating a survey or undertaking some interviews without a clear set of objectives and having staff with the skills to conduct the interviews and analyse the outcomes.

Ethnographers use a range of methods depending on the situation or need to gain different slices of understanding a target group or situation of interest. These typically include

- Semi-structured or in-depth interviews
- Asking employees to demonstrate and explain the approaches they are describing
- Asking exploratory questions in the process of observing employees go about their usual activities to gain context on their actions
- Surveys
- Diaries

Xerox PARC has played an important role in the development of IT but its contribution to industrial ethnography is far less well appreciated. Xerox PARC was a pioneer in hiring social scientists into corporate R&D and integrating them among its technological staff. In effect it sparked an interest in what might be regarded as industrial ethnography as distinct from social ethnography.

One of the pioneers of ethnography at Xerox PARC was Richard Harper. In 1998 he wrote 'Inside the IMF' (Harper 1998) which remains the only comprehensive ethnographic

study of information management in a single organisation, in this case the International Monetary Fund. The book is subtitled 'An ethnography of documents, technology and organisational action' and starts with an introduction to the evolution of ethnography and in particular the value of organisational ethnography. There is a passing reference in the book to workarounds but in the mid-1990s, when the research for this book was undertaken, document management technology was in its infancy.

Ducheneaut et al (2010) provide an introduction to ethnographic research in what they term 'virtual worlds'. The final section of this overview looks specifically at using a digital ethnography tool kit to solve business problems, though without specific reference to the discovery of workarounds.

Although not specifically concerning workaround discovery Gupper and Mörike (2022) consider the role of internal social media channels in supporting ethnographic research.

"While digital communication platforms enable researchers to communicate with research participants across large distances, or observe digitally mediated interactions at play, our results highlight the limits researchers face when employing such platforms in their research. Hybrid settings, where communication flows are both in-situ and digitally mediated, further increase= the complexities. An understanding and reflection of these limits should thus be an integrative part of any ethnographic fieldwork makes use of digital communication platforms"

The authors present a three-level model of digital visibility in ethnographic field work, namely Invisible, Uncertain and Visible and conclude with four questions that should be considered by any person developing a digitally supported ethnographic research project

- What aspects relevant for my research question can remain hidden if I choose to conduct only digitally mediated research?
- What connotation(s) do(es) the digital communication platform(s) carry in the context in which I conduct research, and how will this meaning ascribed to the platform influence the insights I can gain there?
- What forms of communication do(es) the digital communication platform(s) I intend to use for my research enable, [and] what forms are not supported?
- In which physical context can I perceive which forms of communication in a hybrid setting, and what might remain either uncertain or invisible to me?

Over the last decade computational ethnography has emerged to offer a wider range of quantitative techniques through data logging and process tracking and also enhance the value and veracity of diary studies based on randomly timed requests to an employee to complete a survey response, or to have the response request triggered by a specific action.

Van der Schaft–Bartis (2013) made an important

contribution to the use of ethnographic techniques in her 2013 thesis. Section 4 of the thesis considers the options available to researchers when investigating organisational processes with comments on the role and challenges of each.

Shaft-Bartis offers a very important perspective on research methodology

"An important factor is that, although I managed to develop a good relationship with the research participants, the collected data was possibly influenced by their interpretation of (1) the term "workaround" and (2) my research and its consequences. They might have forgotten, or decided to rate unimportant, unnecessary – or risky – to share certain tricks with me. This might be in the background of having found a bit less individual solutions than I expected – both during the interviews and the observation. Although the method of observation somewhat counterbalances the possible congruence between their actions and the story told, but due to technical details I sometimes had to ask questions to complement the observation – this made the observation less neutral and less "invisible". Therefore, it has to be highlighted that the collected data is very much defined by the explanations of the users. This window for biases brings some weakness to the reliability of the collected data."

The author goes on to note;

"It is important to mention that I entered both companies through connections to the Managing Directors. I have to assume that as a consequence, my person, my presence and my research was also connected to the top management. This might result

in the participants being less open with me – with or without intention. Naturally they were not able to see the consequences of showing me a practice what might be forbidden. As a further result, the top management perspective is strongly present in the thesis."

These caveats are quoted in full as they need to be taken into account in any ethnographic research.

This raises the important issue of whether to use internal staff resources to undertake an ethnographic study or to out-source the project.

Some recent research papers by Mörike (2013) provide an excellent introduction to the value and challenges of ethnographic research. In her initial contribution to the research literature presented the concept of working misunderstandings. A research project undertaken in India is described which uncovered some differences in the ways in which different teams worked on a project. Although the term 'workarounds' is not specifically used, the paper is a valuable introduction into the use of ethnographic research, especially where there is an emphasis on direct observation.

More recently two case studies (Morike 2022) are reported, one within a small engineering company and the second in a clinical healthcare setting. Both papers provide a wealth of detail into the processes, benefits and challenges of ethnographic research methods.

Alfredo (2022) described in detail the training that is required to undertake direct observation of processes in use.

The focus is on tracking surgical processes in hospitals but the advice given on the importance of training observers has a much wider applicability, going right to qualitative edge of the quantitative-qualitative spectrum.

Process mining

Over the last decade the development of business process modelling and process mining has been very rapid in terms of both capability and availability. Van De Aalst (2013) provides a good introduction to the technology of business process mining prior to the recent adoption of machine learning technologies. Van De Aalst is also the author of a book on process mining (2016). Process mining records (usually on a time line) the duration of each step of a process. Task mining records the interactions between the employee and the desktop, tracking key strokes and migration between applications. The end result of both is a substantial database of log data which is going to take both time and a detailed knowledge of each process to identify potential workarounds.

The initial work on this approach was undertaken by Outmazgin (2013). This paper is important to consider as the authors categorise workarounds into six categories of which only four can be detected by data logging.

The two cases where detection was regarded as not feasible were

Type B – Selecting an entity instance that fits a preferable path

This type of workaround relates to situations where a

"legitimate" process execution is performed, but the entity instance that is used does not represent the actual one. Rather, it is chosen in order to comply with the transition conditions of the process.

Type F – Separation of the actual process from the reported one

In this workaround type, at a certain stage the process participants continue the process manually, possibly until the process is completed. At a separate point in time, the actions that were performed (or should have been performed) are reported in an orderly manner. This is done in a post-hoc manner, only for the purpose of documentation and reporting.

The authors conclude their paper by commenting

"Developing an understanding of the workarounds that take place and particularly of the reasons that drive them would be valuable in improvement efforts. Corrective actions can include redesigning the processes, improving the data flow, the permission and control mechanisms, role definitions, and also training and disciplinary actions. This is expected to lead to improved performance as well as compliance. Future research will aim at investigating the reasons for workarounds, and establish relationships between process properties, such as bottlenecks and number of participants, and the frequency of workarounds."

A later paper (Outmazgin 2016) reflects on this research project. In the conclusion the comment is made

"We note that considering our notion of work-arounds, the detection might include both false positives, cases that are falsely indicated as work-arounds, and false negatives, actual work-arounds that are not detected. Specifically, we define work-arounds not just as incompliant behavior, but as one that involves intentional defiance of known procedures. Clearly, we have no means for assessing user intention from event logs. To this end, we rely on the list of work-around types, which was obtained through interviews where users indicated what they perceive as work-arounds. It might be that the resulting patterns also include incompliant behavior performed for different reasons."

That is a very honest assessment but it inevitably raises issues for an organisation. False indications may result in employees being challenged to justify the approach they are taking when in fact they are working compliantly. False negatives could result in high-risk workarounds not being detected and addressed.

Quantitative research using data logging and process mining might well give a sense of scale of workarounds but may not even identify the employees undertaking the workaround. This is especially the case where there is a use of shadow IT to undertake a process (the ever-useful Excel file) that does not show up on the process mining dashboard.

Deep learning approaches

Over the last decade there has been considerable progress in using AI/machine learning approaches, often embedding

the outcomes within a Design Science Research (DSR) framework. Two good introductory papers to the logging methodology come from Weinzierl et al (2020 and 2022).

An important forum for the presentation of research into business process modelling is the annual Business Process Management conferences which take place in Europe and started in 2003.

As an illustration of the scope of the conferences the topic sessions in the 2022 conference were

- Task Mining
- Design Methods
- Process Mining
- Process Mining Practice
- Analytics
- Systems

Typically there are around 30 papers presented at these conferences as well as tutorial workshops.

Small and medium-sized organisations

Undertaking workaround discovery in small and medium-sized organisations is the subject of a paper by Wijnhoven (2023). In these smaller organisations processes may be more ad hoc and less well documented. This paper provides a description of workarounds discovered in the course of a research project at an engineering company with 170 employees. The conclusions of the authors are

- Process mining in smaller organisations can be particularly challenging because of the informal nature of these organisations, which leads to a less complete de jure process model and under-developed process-aware system semantics.
- It can be difficult to classify non-compliance cases as workarounds. Fraud and obstruction may remain hidden.
- Evaluating different categories of workarounds can be beneficial for determining priorities or management actions related to workarounds. However, the role of process mining in this context is limited and human insights (e.g. interpretations) in the broader context of the work system processes are necessary.

Workarounds in clinical workflows

Most of the research into implementing business process management applications to detect workarounds has been in enterprise information systems. Workaround detection is of great importance to the use of Electronic Health Record systems in hospitals and primary care facilities. An important contribution in this sector has been made by Beereport (2021) primarily based on her PhD thesis (Beereport 2021). This thesis is based on a comprehensive literature review of over 250 research papers together with empirical investigations at a major hospital in the Netherlands.

A subsequent paper (Van Der Wall et al 2022) presents the

development and utility of SWORD, an acronym for a semi-automated WORkaround Detection (SWORD) framework. Of particular value is a table of 22 log patterns which might indicate the use of a workaround.

This research has been partially funded by the WorkAround Mining Lab of the University of Utrecht through NWO Open Technology Project "WorkAround Mining (WAM!): Mining the emergence, evolution, and diffusion of workarounds in health information systems" (Project Number 18490). The objective of this Laboratory is to investigate the emergence, evolution, and diffusion of workarounds in organisations. The projects adopt different research methods, such as interviews, observations, and process mining.

Process vs information

There is a fundamental problem with logging-based applications and that is that the focus is on time taken, and to some extent the paths through related processes, but there is no tracking of the content itself. As a result information workarounds cannot be detected and (as discussed in Chapter 9) these potentially carry a much higher corporate risk. It should also be appreciated that employees with a neurodivergent condition may have time-blindness as a result. They may not be able to judge the passing of time, work to a very closely defined time-line for a process step and may also need a longer time to work through the options for a process step.

This is a particular problem in clinical Electronic Health

Record applications where an error in the notes on a patient could have serious consequences. In EHR logs it is usually possible to detect free text outside of a text box but with no ability to check on the accuracy of the text. This also gets into data privacy issues where access to patient records is very tightly controlled.

Integrating qualitative and quantitative research

The integration of qualitative and quantitative research is often referred to as a 'mixed methods' approach. There is a substantial literature on this subject, a number of books, and a research journal, Journal of Mixed Methods Research.

The bottom line

The balance between quantitative (data logging) and qualitative (surveys and interviews) methodologies is very difficult to determine at the start of a discovery project and may need to be modified in the course of the project**.** Using process mining for small and medium-sized organisations runs into many challenges as the processes are often not well defined. In Chapter 5 research into the use of workarounds to enterprise systems is presented

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6.

WORKAROUNDS IN ENTERPRISE SYSTEMS

In this chapter

Probably the majority of research papers into the use of workarounds in enterprise applications are concerned with Enterprise Resource Planning applications, which are often the backbone application of the organisation used to support processes that deliver a service or a product to a customer. Other enterprise applications, such as those supporting human resources, asset management and finance, are primarily focused on the operations of the organisation. This chapter summarises the outcomes of some of the core research papers and provides a table of papers which have a substantial list of citations which could provide the basis for further research.

Undertaking academic enterprise research

In Chapter 5 the approaches to organisations discovering workarounds are presented. In this chapter the discovery methodology changes because the focus is on the conduct and analysis of academic (and therefore external) research into workarounds.

There are many problems to overcome in undertaking research inside an organisation.

These include

- Maintaining the confidentiality of the internal processes and success factors of the organisation.
- Gaining a good understanding of organisational culture and also organisational language (the way in which employees refer to departments and processes) so that asking for explanations during interviews is minimised.
- Ensuring that the responses to surveys and interviews are not biased by employees gaming these to create a false impression of success and satisfaction, or (on the other hand) using them as an excuse to get a message through to senior managers about issues with organisational processes and even managers.
- Specifying and achieving a representative cohort of interviewees.
- Setting a realistic schedule for the project that can be adjusted to take account of internal developments or the unavailability of key personnel.
- The extent to which the organisation expects to be able to review any publications and have control over the way that outcomes are presented.

As mentioned in Chapter 5 there is also the issue of developing

large-scale ethnographic research projects as this methodology is not widely used in academic research.

There is a widely used model for organisational research which considers

Getting in – identifying target organisations and gaining physical and digital access.

Getting on – maintaining the required degree of access and project progress.

Getting out – agreeing on an end point to the research and on what can be included in published reports of the project.

Getting back – the ability to revisit the organisation to assess progress on outcomes and to revalidate data.

Given that there may well be over thousand research papers on ERP implementation (though relatively few specifically examine workaround issues) the papers listed below provide a starting point to explore research strategies, in particular the way in which interviews are planned and undertaken. They are presented in chronological order as each lists citations to related work. Together they cover research in the period from 2000 to 2022. The papers by Soh (2000), Soh (2003) and Ignatidis (2007) were published before Alter's seminal paper (Alter 2014) on the definitions and characteristics of workarounds.

Lead author	Date	Location	Interviews	Citations
Soh	2000	Singapore	Not stated	12
Soh	2003	Singapore	30	22
Ignatiadis	2009	UK	27	130
Van Der Schaft-Bartis	2013	Hungary	119	180
Roder	2014	Germany	22	31
Hustad	2016	Norway	6	33
Drum	2016	USA	16	50
Drum	2017	USA	20	45
Pernsteiner	2018	USA	12	30
Malaureni	2019	France and China	49	120
Davison	2021	Hong Kong	31	67

The scalability issue

It is immediately obvious from this table how few interviews have been conducted in the research projects with the notable exception of the thesis of Van Der Schaft-Bartis. This in theory raises the question about how representative the projects are of not only the organisation itself but of the wider use of ERP applications. However, because even the small and effectively random number of interviews uncovers a range of workarounds it could be reasonable to assume that in fact workarounds are endemic in enterprise applications.

Summary of research outcomes

Research

There is a wide variety in the number of interviews undertaken. Little information is provided about the extent to which the interviews are representative of a range of 'personas' in the organisation and how the decisions were taken on which employees should be selected for interview.

In addition there is rarely any comment on the period of time that the interviewees have been working with the organisation and their individual experience of the particular role that forms the basis of the interviews.

Several papers refer to managing the concern of interviewees that the information they are giving will be brought to the attention of their managers.

Most of the interviews are with employees using the applications; more senior managers are rarely interviewed.

Because of the small number of interviews it is not possible to scale across the entire organisation or across other organisations in the same business sector.

Processes

There is little consideration of the extent to which customisation is a permitted workaround.

In a number of instances the workarounds were making use of shadow IT (often Excel spreadsheets) to manage data consolidation and application transfer.

The way in which access permissions are granted can often be a constraint to the effective use of the systems, especially

where an employee only needs very occasional access to an application to validate a process or outcome.

With the exception of the work by Drum et al there is no consideration of information workarounds, only process workarounds. (See also Chapter 8).

Outcomes

Each of the three key parties to this process—key users, IS department personnel, and the ERP vendor— has different and specific knowledge (organisational requirements, existing IT infrastructure, package functionality, respectively) that is difficult to transfer to one another.

Because of constraints on the schedule of the research it is not possible to report on the extent to which the organisation was able to reflect on the outcomes and make changes to operational procedures.

Several of the papers suggest management actions that could be taken to mitigate the impact of workarounds but these are usually developed post the closure of the fieldwork and so there is no validation on the potential or actual value of these.

For this reason there is no ideal solution. There are limits to the changes that can be made to an ERP application post-implementation and limits to the patience of employees faced with using ERP applications that are not fit for purpose.

Training is often limited to an initial familiarisation with no follow-up post-implementation even though workarounds may not evolve until some period after implementation.

Managers are faced with often competing factors when deciding whether to accept a workaround, in particular the balance between compliance risk and the expected gain in efficiency from the workaround.

There is little discussion of the down-stream impacts of a workaround. The nature of the workarounds is often described, which is helpful, but there are no interviews with employees further down the process chain to gain an understanding of whether they are aware of an upstream workaround, and if they are what the impact could be on their own performance,

Workarounds are not just the response of an individual employee but can be coordinated with other members of a team and progressively upgraded as the need arises.

A global HQ may be completely unware of the level of use of workarounds in local subsidiaries, especially those in another continent.

Longitudinal research

With very few exceptions the research projects that have been undertaken are of quite a short duration. This is reflected in the small number of interviews and a lack of any long-term perspective that looks back at the organisation and reflects on any changes that might have been implemented to take advantage of workarounds. The results of a two-year longitudinal study (Barelheimer, Wolf and Beverungen 2023) of three organisations, a media company, a professional services company and a public institution shed important light on the

role of workarounds in supporting innovation in systems design. The study approach is qualitative but with careful coding and analysis of the outcomes of in-depth interviews. The 66-page paper includes a bibliography of over 200 papers and so provides a very good starting point for further research.

The bottom line

There has been a considerable amount of research into the factors that affect the implementation and adoption of ERP systems, and these factors are listed in Chapter 3. Only a small percentage of these papers specifically research the incidence and impact of workarounds. In effect the small number of interviews (relative to the total number of employees in the organisations) could be regarded as random selection. Yet in all the research papers this random selection of employees results in there being the disclosure of workarounds which suggests (though does not prove) that workarounds are endemic in enterprise application implementations. In Chapter 6 the use of shadow IT as workarounds is discussed.

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7.

SHADOW IT

In this chapter

Although shadow IT could be considered as an example of a workaround the topic has a life (and a chapter) of its own, mainly because surveys consistently indicate that there is widespread use of shadow IT in organisations. Workarounds certainly carry risks but these are limited to an extent as the workarounds are developed on IT-approved systems. This is not the case with shadow IT and that brings with it additional risks, especially around IT security.

Are 'workaround' and 'shadow IT' synonyms?

In the context of this book the question is whether these two terms are synonyms. There is a view that workarounds are more short term in duration and developed and used by an individual employee experiencing a problem with the effective use of an enterprise application. Shadow IT, on the other hand, tends to be used by individuals and groups of employees for a longer duration.

An early, and very detailed, description of the use of shadow applications is presented by Handel (2011) with many

examples from a major aerospace company. However, the paper does not refer to 'shadow IT' as a generic description, only to the fact that these applications exist in the shadows of the organisation.

The definition of 'Shadow IT' is generally attributed to the work of Rentrop and Zimmerman (2012).

"Shadow IT describes the supplement of "official" IT by several, autonomous developed IT systems, processes and organizational units, which are located in the business departments. These systems are generally not known, supported and accepted by the official IT department."

Contemporary with the emergence of this definition comes the concept of 'feral IT' by Thatte (2012).

"Feral practices can be broadly defined as usage of information technology which deviates from organizational norms and exists beyond the control and/or knowledge of the organizational IT management."

The authors make a case for there being a difference between 'shadow IT' and 'feral IT' but it would seem that there may have been an aversion to the adoption of 'feral' through its identification with animals. 'Shadow' has no such connotations and is now certainly much more widely used. The paper by Thatte has only been cited 19 times since publication. Raković (2020) plots the occurrence of the terms shadow IT, feral IT and IT workarounds which confirms the dominance of shadow IT as the preferred descriptor, and also

the significant increase in the publication of research papers on these topics since around 2014.

The extent to which shadow IT can be regarded as a workaround is considered by Shaikh (2021) in which he matches the characteristics of shadow IT to the five voices framework developed by Alter (2014).

Does it make any difference?

When it comes to Shadow IT it seems that there is much less reluctance on the part of employees to respond to an external survey of whether they use Shadow IT applications. One reason for this could be that they do not need to disclose confidential information about how they use shadow applications, just the brand of the softwarr application. A search on Google (other search services are available!) will quickly locate a number of surveys on shadow IT adoption. Given the potential shelf life of this book there is little point in highlighting the outcomes of these surveys other than to note that around 80% of employees seem to be using a shadow IT application.

Some examples include

- Productivity apps such as Trello and Asana
- Employee experience applications such as Simplrr and Kazoo
- Cloud storage, file-sharing, and document-editing applications such as Dropbox, Google Docs, Google Drive, and Microsoft OneDrive

- Communication and messaging apps including Slack, WhatsApp, Zoom, Signal, Telegram, on personal email accounts

Many of the case studies of workarounds refer to the use of Excel as either a database or as a financial planning application to aggregate data before uploading it in to the business application. Excel is of course an IT-supported application but it could be that an employee uses their own instance of Excel to aggregate data.

As a result of the significant increase in remote and hybrid working employees might well bring these applications to the workplace because they already use them in their personal lives. Another factor is that clients and customers may decide to invite employees they work with on a regular basis to use the services that they have adopted.

The risks associated with these shadow IT applications are significant, especially in terms of information security. A workaround on a monitored application should still maintain the security management imposed by IT. That will not be the case with a shadow IT application. USB drives are a very common example of how easily security protocols can be breached. It seems that more attention is being paid to the management of shadow IT by IT managers because of the security implications for the organisation within the context of a ISO 27001 information security policy.

What is not mentioned in any detail in the research papers is

the extent to which shadow IT applications are not backed up by their owners.

Literature reviews

Two substantial reviews of the research literature on shadow IT have been published. The review by Klotz et al (2019) of 126 research papers published up to around 2017 takes into account a taxonomy for shadow IT developed by Kopper (2016) a co-author of Klotz. The scale of the published literature over the period from the early studies in 2010 is an indication of the high level of academic interest in Shadow IT.

Raković (2020) reviews 90 papers and focuses in particular on management issues relating to shadow IT.

There is also an interesting perspective on the reasons why employees adopt shadow IT (Haag 2019) which considers 82 citations. However, there is virtually no consideration of the concept of 'workarounds' in these papers, although de Vargas Pinto (2022) considers the relationship in some detail.

Workarounds in software development

Another aspect of IT management where workarounds are widely recognised and adopted is in the process of software development. This is a subject that has been quite widely studied and using workarounds for this purpose is regarded as 'good practice'. Two recent papers by Song (2020) and Lamothe (2020) provide a starting point to gain an understanding of this practice.

The bottom line

Up to this point in the book I have been focusing on what

might be regarded as the classic example of workarounds, where an employee develops a way of improving their personal productivity with an IT-supported enterprise application. Although this is a short chapter, introducing shadow IT and API development as similar in principle and in practice to the established view of workarounds suggests that IT teams are facing significant internal management problems at the same time as they are seeking to introduce upgrades to current systems (notablywith AI) and new applications. Chapter 6 focuses specifically on workarounds in clinical systems, which as discussed in Chapter 3 have similarities but also differences to enterprise systems.

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8.

WORKAROUNDS IN CLINICAL SUPPORT SYSTEMS

In this chapter

There is much in common between the enterprise systems that were the subject of Chapter 6 and the clinical support systems that are the subject of this chapter. The most important difference is that a workaround or the use of shadow IT could compromise the well-being of a patient, even to the stage of a fatality. As a result there seems to be a much more proactive approach to identifying workarounds and in particular assessing whether these workarounds should be incorporated into the design and operation of the clinical support system. In general there seems to be more openness in this sector, with detailed reports on implementation issues and a number of major conferences.

An overview of clinical support applications

In the business environment there are decades of experience in implementing and managing enterprise applications, largely based on previous experience within the organisation. The

concept of Electronic Health Record applications for primary and secondary healthcare organisations is by comparison quite novel and general practitioners (primary) and hospitals (secondary) have had to start from not only a blank sheet of paper but indeed largely paper-based systems.

The scale of the work involved in implementing these applications puts considerable strain on the IT resources of the facility, with external systems integrators playing a major role in the implementation. The training requirement is immense within clinical situations which need to provide 24/7 levels of care with a limited ability and budget to employ additional employees after having made a very substantial financial investment in the software and support services.

The records being handled by these systems contain substantial amounts of text content, most of which will be deemed 'sensitive personal information' under GDPR. Much of this content is likely to be added in situations of stress in caring for a patient.

Any failure of the application could have a serious impact on the health of a patient and on the reputation of the hospital, which is subject to external audit by national healthcare agencies. Indeed the priority for clinical staff is to ensure that patients receive the best possible treatment even if that requires a workaround to be used when the application is seen as 'getting in the way' of treatment and a full recovery by the patient. This can result in some ethical issues about the extent to which processes can be modified if in the judgment

of the individual clinician the modification will result in a better outcome for the patient.

A substantial amount of research has been conducted into the implementation of these systems and on the way in which workarounds emerge and are justified. Clinical staff will be very aware of, and have access to, the research literature, and can use this research to optimise the use of the applications in their own organisation. However, there have been very few research papers in which interviews are undertaken in both business and clinical settings, and even these often do not rigorously compare the outcomes from the two settings.

A bibliometric analysis of research papers on e-health by Gui et al (2019) illustrates well the rapid growth of research from 238 papers in 2007 to 2116 in 2016.

Clinical system development

The evolution of these clinical systems was catalysed in the USA by the HITECH Act of 2009. The five HITECH Act goals have been described as the five goals of the US healthcare system – improve quality, safety, and efficiency; engage patients in their care; increase coordination of care; improve the health status of the population; and ensure privacy and security. Elliott (2022) provides a very detailed account of the evolution of these applications. There are differences in the functionality of EHR and EMR (Electronic Medical Record) applications but for the purposes of this book I am focusing on EHR applications. Many of the observations also apply to EMR applications.

An important initiative in assessing the progress of the implication of an EHR application is the HIMSS Electronic Medical Record Adoption Model (EMRAM). EMRAM measures clinical outcomes, patient engagement and clinician use of EMR technology to strengthen organisational performance and health outcomes across patient populations. The internationally applicable EMRAM incorporates methodology and algorithms to score a whole hospital, including inpatient, outpatient and day case services provided on the hospital campus. EMRAM scores hospitals around the world relative to their digital maturity, providing a detailed road map to ease adoption and begin a digital transformation journey towards aspirational outcomes.

The assessment methodology is an element of the Healthcare Information and Management Systems Society (HIMSS) which is a member-based society committed to reforming the global health ecosystem through the power of information and technology. HIMSS has served the global health community for more than 60 years, and has offices in the USA, Germany and Singapore. Its membership comprises nearly 120,000 individuals, 430+ provider organisations, 500+ non-profit partners and 550+ health services organisations.

In the UK the initial focus was on the development of a national Health Record system and indeed when researching EHR activities in the UK using Google it is challenging to distinguish between the national programme managed by the National Health Service and the gradual implementation of

EHR applications in hospital trusts (from the mid 2010s) and in general practice.

Another factor that inevitably affects the implementation of EHRs is the attitude and funding of these applications by national healthcare agencies. Although there are many research papers on the implementation of enterprise applications, the research is almost always anonymised. In the case of EHR applications the institution involved is usually clearly denoted and in general there seems to be a wider exchange of experience in the health care sector than in the enterprise sector, driven by the overriding issue of achieving the best possible outcomes for patients.

There are annual HIMSS conferences held in the USA, Europe and Asia-Pacific regions, with the USA event in April 2023 attracting over 1000 exhibitors. Typically, the attendances are of the order of 50,000 delegates. The conference itself offers a very wide range of papers from both software and services vendors and from senior clinicians. Looking through the conference papers for the USA event indicates that there were none that specifically mentioned workarounds.

Kobyashi (2005) reviews the outcomes of earlier research and provides a situational categorisation that probably remains valid today even with a much wider use of EHR applications.

- *Dynamic artefacts, such as the large whiteboards used to display OR [Operating Room] status, have been shown to*

play an important role in the moment-to-moment coordination of medical work by helping workers keep abreast of ongoing exceptions and problems. However, many key artefacts leave no lasting body of knowledge. As a result, there is a lack of organizational memory for workarounds and their effectiveness.

- *Despite the omnipresence of cognitive artefacts in the OR, much coordination takes place informally, through conversational and observation, rather than through information systems Charge nurses and anesthesiologists balance the effort required to gather information against the value of accurate information by performing optimal sampling. This suggests that in many cases, workarounds are devised under situations of incomplete information.*
- *There are limitations in how quickly information is distributed across different hospital locations, even when it is formally embedded in information systems . Again, this suggests that workarounds may be performed without full access to the pertinent information.*
- *Problems in the specification of workflow patterns and the extent to which workflows can handle exceptions also have implications for the types of workarounds devised by personnel and the success of these workarounds. For example, static assignments of personnel to roles can create problems when extra help is needed in an emergency.*
- *Observational research on nurses' problem-solving strategies indicates that in the majority of cases, they deal*

only with the immediate problem rather than addressing its source. Attempts to alter the system in order to deal with the root cause occur much more rarely. This suggests that medical organisations have problems developing lasting solutions to workflow breakdowns.

Personalisation

As mentioned in Chapter 6 the ability to personalise an application, which is increasingly an important feature of enterprise applications, could be regarded as a workaround in that it is supported by the application. There could be a gap between it being technically possible and being an approved change or enhancement to the process.

HIMSS published a blog post in 2022 on this issue, which is reproduced below in full, which raises the issues around a grey area between workaround and personalised view.

"A common thread for "personalizing the system" is that while there are often tools available to personalize and configure the system, they can be difficult to discover, challenging to scale and share, and overwhelming to interact with in the clinician workflow. If it were simpler to personalize or optimize one's own EHR experience, there would be little need for an organization to conduct optimization exercises after the initial implementation. After spending eight or more hours in formal training, and then significant time post go-live with practical EHR use, having some simple means available for self-

configuration might remove additional hours of optimization, which will in turn reduce physician frustration.

Unfortunately, clinicians often figure out inconsistent "work-arounds" for the original system design as an ad-hoc means of personalisation. Moreover, each EHR update, or "improvement" that is introduced can muddle those personalisations. Updates may then necessitate new workarounds and additional time and cognitive effort to both negotiate the new version, as well as to figure out how to apply prior knowledge to the new system to make it work effectively for the user. By studying these common workarounds, we can identify areas in the system that need design improvements."

This grey area also complicates process mining as the log data may not show whether or not the employee has used an 'approved' personalisation, or a personalisation that they regard as de facto approved just because it can be implemented on the system.

Innovation

To a greater extent than is the case with ERP applications there is a stronger commitment to identifying how understanding workarounds in the health sector can support innovation in the delivery of health care. Dupret (2018) in particular has focused on the process of innovation. The paper is important in two respects.

The first is that it reviews progress in this area in 2005-2008 and the second is that the examples include studies in geriatric medicine and in psychiatric care. In addition there is a

discussion about the way in which health care services are managed and delivered in Denmark which provides important context to the interpretation of the outcomes of the case studies.

Her conclusions was

"Technology workarounds do not necessarily imply technological shortcomings or professional incompetence – quite the opposite. The technology workarounds shown in this paper provide important insights into how health care technologies seem at times to make professionals' ability to handle the complexity of health care practices invisible. It is not that these technologies in themselves have no important role to play in the sustainability and efficiency of high standard health care, but in some situations, workarounds can consist of new innovative practices that should be acknowledged as such, and they can be a paramount sign of ethically based professional competency and organizational success. Potentially, the critical practice among health care professionals offers crucial insights into health care and creates possibilities for rearranging it through bottom-up processes and the systematic involvement of all stakeholders."

A notable feature of innovation in this sector is the role that nurses can, and should, play in developing improved and new applications. They are recognised as being core members of a clinical team and may have greater contact with patients than more senior clinical staff, and be directly responsible for the bed-side provision of drugs and other medical interventions.

Information quality

The largest negative effect was between satisfaction and workarounds of the EHR system to overcome post-adoption dissatisfaction with information quality (Bozan 2018). The research suggests that workarounds are due, to a large extent, to dissatisfaction with the quality of information that the EHR system takes or provides across all four dimensions of information quality. When providers feel dissatisfied with the EHR system's ability to provide or capture quality information related to patient care, they are more likely to work around the system to capture or acquire the needed information.

Ethics

In the case of workarounds in general, and in healthcare in particular, the issues of the extent to which the development and adoption of workarounds are ethical is an important topic of conversion. This is a complex area of which I have no direct experience, so I can do no more than point you in the direction of *Are workarounds ethical? Managing moral problems in health care systems*, authored by Nancy Berlinger (2015). A cursory search of Google Scholar for [workarounds AND ethics] returned a results count of 19,700 for the period from 2019 to the present time.

These references are not just related to the issues of IT workarounds. As an example a paper by Kelly (2022) observes

"Scheduling concurrent procedures is an example of a 'workaround.' When complex systems or protocols frustrate actors, some will attempt to circumnavigate the given process by

finding a workaround. The complexity of OR allocation and the large number of actors (i.e., administrators, surgeons, anesthesiologists, nurses, staff, etc.) invites workarounds. These solutions may be innovative, yet they represent a source of controversy because workarounds are potentially ethically problematic.

Although they often represent beneficent intentions (e.g., providing prompt care to an individual patient), workarounds can inadvertently introduce unfair bias and unequal distribution of resources. Furthermore, workarounds are construed as rule 'violations' in some institutions, which could conceivably contribute to a sense of moral distress and burnout among healthcare providers. Increased awareness and ethical evaluation of the various workarounds that emerge can enhance system learning and potentially improve the allocation process."

There is probably no better quotation to show that workarounds are indeed here, there and everywhere.

Literature reviews

The table below lists research papers and theses which have a substantial critical review of the literature.

Lead author	Date	Location	Interviews	Citations
Kobayashi	2005	USA	Survey	9
Halbesleben	2010	USA	222	95
Huuskonen	2013	Finland	44	55
Friedman	2014	USA	45	56
Jylhä	2016	Finland	Survey	50
Blijleven	2017	Netherlands	47	69
Blijleven	2017	Netherlands	NA	63
Tucker	2018	USA	Survey	60
Dupret	2018	Denmark	NA	57
Patterson	2018	USA	NA	60
Bozan	2018	USA	64	91
Blijleven	2019	Netherlands	47	42
Gui	2020	USA	45	40
Beerepoot	2021	Netherlands	NA	270
Persson	2021	Netherlands	NA	67
Baillette	2022	Global	NA	220
Elliott	2022	USA	20	120

The theses by Beerepoot and Elliott are very comprehensive. The thesis by Beerepoot focuses on methods of detecting workarounds in the clinical healthcare sector and the thesis by Elliott examines the flows of information in a clinical (psychiatric) setting.

The bottom line

Many of the issues that arise in a clinical healthcare setting are unique to healthcare but there are also issues that are common to both enterprise and healthcare settings. With a few exceptions (notably the work by Beerepoot) there are very few research projects which compare and contrast workarounds in these two settings. In the next chapter the focus changes to consider the potentially very high risks from workarounds in information-specific applications.

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9.

WORKAROUNDS IN INFORMATION MANAGEMENT

In this chapter

The focus of the research on workarounds in the enterprise and in a clinical setting is on the extent to which an employee uses an IT process in the specific way in which it was designed to be used. A significant amount of work has gone into identifying the reasons why the employee might create, use and share a workaround, but very little attention has been given to the extent to which a workaround could have an impact on information quality and as a result have an impact on the extent to which decisions made on the information might not be optimal. This could result in significant risks to the organisation.

Cut, paste and deliver

When it comes to information management workarounds you have probably used a workaround every day, and maybe every hour. The workaround is known better as 'cut and paste' and we have all done it, as indeed I have in writing this book.

Although organisations of all sizes and sectors use IT to support the execution of processes the content in these processes is almost always validated at the point of being added to the process through a series of data quality checks. At a very simple level, using GB to denote Great Britain is not an allowed term, and the system only accommodates UK. Once in the system the data element is then locked down so that it cannot be changed without due authority from a manager with the training, experience and authority to do so. The data quality and consistency is managed through a Master Data Schema which is managed with considerable care.

However there are many processes which depend to a greater or lesser extent on the creation of what is often described as 'free text', ranging from emails to the Annual Report of the organisation. The quality control of this content should in principle be governed within an information management strategy and set of policies but very few organisations have an information management framework or any policies.

For many years I have been promoting a high-level information charter as a framework for information management that I recommend a Board of Directors should adopt in the same way as they will have policies on ethical behaviours or climate control.

The charter is that employees can :-

1. Find the internal and external information they need to

make effective business decisions that reduce corporate risk, enhance the achievement of strategic and operational objectives and enable them to develop their careers.
2. Trust that the information they find to be the best and most current available.
3. Publish information so that it can be used by other employees both as quickly as is appropriate.
4. Locate and take advantage of the expertise and experience of other employees.
5. Link to internal and external social and business networks.
6. Be confident that the roles and responsibilities of their manager include ensuring that their information requirements are recognised and addressed appropriately.
7. Be assured that the organisation complies with all legal and regulatory requirements for the retention, use and transmission of information.
8. Take advantage of training in how to be effective users and managers of information resources.

Laumer et al (Laumer, Maier and Weitzel 2017) highlight that very little research has been carried out on workarounds in content management systems, and that is still the situation. Google Scholar listed 151 citations to this paper but on inspection relatively few are directly concerned with

workarounds and are citing the paper because it provides a good overview of the lack of information management discipline in organisations. The case study in the paper was of a financial service provider with approximately 900 employees. The organisation had introduced a web-based enterprise content management (ECM) system to support organisational processes and employees' work routines, providing information not covered by the core IS (e.g. core banking system) but required to support sales talks and other work routines.

Among the workarounds that emerged from the research were

- Employees call experts by phone when they have a question instead of searching for the information they need in the ECM system.
- If experts do not respond by phone, employees write an e-mail requesting help and information.
- Employees ask their co-workers for help instead of searching for information.
- If co-workers cannot provide the information, they call experts in the organisation.
- Employees use their own local file systems to share information within a group of people.
- Instead of using the information provided that might solve an IT issue, employees open tickets to get help from the IT department

Downstream impact assessment

Business processes rarely have just a single step; one process or task leads onto another process or task, the scope and purpose of which may well be invisible to an individual employee. This could be because the process shifts to a different department or even a different location. A good model for the consequences of workarounds that are information rich has been developed by Drum (2015). These are Neutral, Obstruction and Requirement. A neutral workaround has no impact on the downstream user of the information, an obstruction workaround creates a block on the downstream user's workflow and a requirement workaround is a workaround that is imperative for the completion of the given task.

Processes and procedures

Processes are linear but in an office/document environment there can be multiple contributors to a document in a mix of parallel and linear paths. Whether 'procedure' is a better description is arguable. The important distinction is that it is highly likely that a document is prepared for a reader to make a decision, and that decision inevitably carries with it a degree of risk. A useful illustration of a decision process is that presented by Citroen (2011) in his study of how senior executives collect the information they need to make strategic decisions. The multiplicity of actors and processes involved in the preparation of a document makes it very difficult to identify where workarounds have been undertaken. The paper

includes a flow chart which illustrates quite graphically the complexity of a work flow leading up to a strategic decision.

This is especially the case when contributions have been made from multiple locations in a multi-national business. Often intermediaries are involved in managing the flows of information. A paper by Brooks et al (Brooks, Oshri and Ravishankar 2018) explores these complex issues in some detail with quotes from participants. A useful bibliography of prior work is provided.

Setting the standards

Many organisations are compliant with ISO 9001:2015 for quality management systems. Clause 4.4 (Quality management systems and its processes) requires the organisation to

"maintain documented information to the extent necessary to support the operation of processes and retain documented information to the extent necessary to have confident that the processes are being carried out as planned."

Controlling documents is a key requirement of ISO 9001:2015 (Control of Documents' (4.2.3)), and one of the required six documented procedures is the Document Control Procedure (4.2.3). The standard specifies that seven controls should be defined within the procedure.

These controls are

1. To approve documents for adequacy prior to issue
2. To review and update as necessary and re-approve

documents

3. To ensure that changes and the current revision status of documents are identified
4. To ensure that relevant versions of applicable documents are available at points of use
5. To ensure that documents remain legible and readily identifiable
6. To ensure that documents of external origin determined by the organisation to be necessary for the planning and operation of the quality management system are identified and their distribution controlled
7. To prevent the unintended use of obsolete documents, and to apply suitable identification to them if they are retained for any purpose.
8. To apply suitable identification to them if they are retained for any purpose.

In developing processes and procedures for managing information the problem with ISO 9001:2015 is that the standard only considers the quality management processes and neither the quality or availability of information, especially in cases where compliance with the standard is not a requirement. Financial information is just one example.

Without any formal performance benchmarks for the quality of the content it is down to an individual employee to make an as-informed judgement as they can about the quality of the information they receive.

The dark side of information

Stone (2020) reviews the literature on information mismanagement and constructs a typology of misinformation that can be applied to analyse project planning and strategic planning processes to reduce the chances of failure that results from information mismanagement. One of the categories in their list of potential sources of what they denote as Dark Side Information Behaviour (DSIB) are system or process issues such as

- Information incompetence systems and processes do not deliver required information and the situation is tolerated.
- Unconscious or deliberate creation/sustaining of a process/system known to support a particular type of DSIB.

However, there is no further analysis of the extent and impact of systems-related issues, and the concept of workarounds is not considered.

A nuclear disaster case study

The Fukushima nuclear disaster took place on 11 March 2011 at the Fukushima Daiichi Nuclear Power Plant in Ōkuma, Fukushima, Japan. The proximate cause of the disaster was the 2011 Tōhoku earthquake and tsunami, which occurred on the afternoon of 11 March 2011 and remains the most powerful earthquake ever recorded in Japan. The

earthquake triggered a powerful tsunami, with 13–14-metre-high waves damaging the nuclear power plant's emergency diesel generators, leading to a loss of electric power.

In 2014 (Thatcher et al) undertook a forensic analysis of the published reports on the causes of the disaster show that a culture of 'nuclear energy is safe'. Communication was informal and oral and a cost saving attitude developed in which natural disasters were viewed as low risk. As a result resources were not provided for protective measures, causing a lack of preparedness for the disaster. Information which did not conform to pre-existing attitudes towards nuclear power was avoided, ignored and distorted.

The paper does not specifically cite 'workarounds' as a cause of the disaster but in effect I would argue that the way in which information was 'managed' was indeed a workaround as it saved time and effort (oral versus documented reports) and important information was not shared with employees who could have taken a contrary view of the opinions expressed.

A question of trust

It can be difficult to appreciate the scale of the information that is pushed to an employee, either by a process (as they are the next link in a pre-ordained sequence) or by a person using email or internal social media. In the case of a personal push the recipient may well know the person or has the means of checking out their credentials using a personal directory. When it is pushed by a system it can well be impossible to find out who created the process and which employee completed

a process that triggered the onward journey of a piece of information. The format of the information is unlikely to be a document (which would usually have an owner) but instead there is data appearing in a structured user interface.

In principle enterprise systems should be able to carry out authority checks on information added to a system, but this tends to be at a very basic level, e.g. does the product number have five digits and two letters? In theory the system should be able to access a product data base to validate the product number but the challenges of maintaining enterprise databases on a frequent-enough level to provide a comprehensive and authoritative validation are significant.

Then comes the problem of detecting the workaround that may have been used to create the data that the employee has received, and being able to judge if the workaround has in any way resulted in incorrect data and information being forwarded down the process line.

Most organisations are unaware of the scale of employees working around a problem by making contact with an 'expert'. This leads into the difficult area of defining what an expert is. In my opinion an expert is someone with apparently more knowledge about a particular topic than I have. It does not necessarily mean that the expert is a senior manager with a long period of employment in the organisation.

In addition there is an assumption that the expert will respond quickly enough for the process to be completed. The

expert contacted may not be available or may not feel it is their responsibility to respond to the query.

Crossing the firewall

Information workarounds inside an organisation will probably have little immediate impact outside the organisation. A notable exception of that assumption is the case of financial information, even if it is not for public circulation. Drum (2015) has considered in some detail the issues that can arise in financial reporting where workarounds have resulted in some degree of corruption of the financial records of the organisation, records that will then be used by internal and in particular, external auditors, to assess the financial performance of the organisation.

Subsequent papers (Drum 2016 and Drum 2017) take this framework further to assess the problems that organisations face in collecting and managing financial information, as this information will have to be forwarded to external auditors for validation.

Information management in a clinical setting

Ensuring that information collection and distribution in an organisation is not compromised by workarounds is of primary importance in clinical settings using electronic health care records. (Jylha 2016) considers incident reports relating to situations where information accuracy has been compromised. This paper does not explicitly include workarounds in the research and analysis but does illustrate the wide range of information-related issues that can arise.

This is also the case with a thesis by Elliott (2022) but the value of the research lies in the direct quotes from clinicians and others managing patient notes under often significant time constraints. There are no specific references to workarounds but the interviews do indicate the pressures that clinical staff experience in managing patient records.

The bottom line

The attention being paid to business process management and process mining might suggest that all workarounds are under observation, even if not directly under control. However, there is a view that 80% of the content in an organisation is text-based. This is managed through procedures which are probably based on previous experience, personal knowledge and personal networks. Tracking these procedures using log data is not going to identify workarounds that have been taken in the development of a document or presentation. Few organisations have robust information management management strategies and policies which provide the basis for creating high-quality content on which business-critical decisions can be based. In the digital workplace, the subject of Chapter 10, data and information applications come together. adding to the complexity of the systems being delivered to an employee.

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10.

THE DIGITAL WORKPLACE

In this chapter

It is time to bring together business processes that are managing data and procedures that are invariably based on documents and content into a 'digital workplace'. The concept of a digital workplace dates back to the late 1990s but remains a concept and a vision rather than a 'product'. In an ideal world the digital workplace should be the integration platform for all enterprise applications but this is a very challenging IT architecture especially when there are legacy applications to take into consideration. Because of this complexity it is probable that workarounds and shadow IT may proliferate in order for employees to engage with, and contribute to, the organisation. In particular employees with neurodiverse conditions (such as dyslexia) may need to depend heavily on workarounds to be able to take advantage of a digital workplace.

In the beginning

The concept of the digital workplace is usually attributed to Jeffrey Bier, who founded Instinctive Technologies in 1996

to provide collaboration applications based on the knowledge that Bier and his co-founders had gained at Lotus Corporation. However some important research was published in the early 1980s about workflow challenges in an office environment which were very prescient. Examples include Gerson and Star (1986), Suchman (1983) and of course Gasser (1986).

In the introduction to their paper Gerson and Star observe

"As any office manager can tell you, even apparently simple pieces of information such as entries on fixed forms are the result of many negotiations and struggles.....In order to create adequate representations then, office workers must somehow reconcile multiple viewpoints with inconsistent and evolving knowledge bases. Since no centralized authority can possibly anticipate all the contingencies that might arise locally, office workers always have some discretion in deciding how this reconciliation is to be accomplished."

However, the authors do not use the concept of 'working around' but instead promote the concept of 'articulation' for the tasks needed to coordinate a particular task, including scheduling sub-tasks, recovering from errors and assembling resources.

They go on to suggest:

"It will always be the case that in any local situation actors 'fiddle' or shift requirements in order to get their work done in the face of local contingencies."

In effect this paper is a charter for workarounds!

Defining the digital workplace

Bier set out five criteria for a digital workplace (White 2012) which still hold good today. There is no published record of the criteria, which he presented at many conferences in the period from 1996 to the mid-2000s.

1. It must be comprehensible and have a minimal learning curve. If people have to learn a new tool, they will not use it, especially those people outside the firewall. The digital workplace needs to be as simple and obvious as email or instant messaging.
2. It has to be contagious. The digital workplace must have clear benefits to all parties involved, to both distributed workers and the different enterprises interacting in these new workplaces. The workplace also has to be a trusted place, thus secure, both for the individual and the companies involved. People have to want to use it.
3. It must be cross-enterprise. The digital workplace must span company boundaries and geographic boundaries. It also must operate outside the corporate firewall with an organisation's customers, suppliers and other partners, and require very little IT involvement, or it will not gain acceptance.
4. The workplace has to be complete. All communication, document-sharing, issues-tracking, and decision making needs to be captured and stored in one place.
5. The digital workplace must be connected. If not, it will

not gain acceptance.

In my view there are some additional criteria (White 2012)

6. It must be adaptive, because companies are constantly restructuring, acquiring new businesses and selling off or closing businesses that no longer fit with corporate strategy. The digital work platform has to be able to be re-configured on an almost overnight basis.
7. It has to provide solutions that are compliant with applicable laws and regulations.
8. It should be imaginative and attract employees to use it because it provides a transformational integration of business, information, knowledge and technology.
9. The speed of change in business and the multiple roles and responsibilities held by each employee mean that the digital work platform has to be predictive so that it is able to anticipate the requirements of the user for data, information and knowledge and anticipate the requirements of the business for links with suppliers and customers.
10. The nature of the connected world we live and work in means that the digital work platform has to provide ubiquitous location-independent access to services at the point of requirement.

With the benefit of a decade of experience I would have added

a further criterion about the importance of providing accessible access for employees.

Tasks, processes and decisions

Until this point the focus of the discussion on workarounds has been related to the context of processes. Over the last few years there has been a focus on tasks, in particular on the way in which tasks could define how employees search. Comparatively little research has been undertaken into the way in which information is used to support decisions, which is what is happening every hour of every day in organisations.

The notable exception is a study by Citroen (2011) in which he explored the way in which senior executives in the banking and pharmaceutical sectors of the Netherlands. One of the outcomes of the research is that there were constant loops back along the chain of information research to revalidate and revise information for decisions which needed to be taken in fast-moving business environments. This loop backwards is important because it means that any end-to-end timing of the process has little value as a metric of performance and success.

The quest for productivity

The quest to be able to increase organisational output with either the same number of (or ideally fewer) employees underpinned the adoption of mechanisation in industry and commerce in the 19th century. It has continued to do so to the present day at both an organisational and national economy level.

According to a report from Microsoft (2022) 85% of leaders

say that the shift to hybrid work has made it challenging to have confidence that employees are being productive. And as some organisations use technology to track activity rather than impact, employees lack context on how and why they're being tracked, which can undermine trust and lead to "productivity theater." This paradox has led to productivity paranoia: where leaders fear that lost productivity is due to employees not working, even though hours worked, number of meetings, and other activity metrics have increased.

The report also highlights that many leaders and managers are missing the old visual cues of what it means to be productive because they can't "see" who is hard at work by walking down the hall or past the conference room. This results in the paradox that 87% of employees feel that they are being productive at work and yet only 12% of leaders are confident that they have a productive workforce.

This concern about worker productivity translates into two business requirements

- "We need to improve the productivity of our processes through further investment in technology"
- "We need to monitor the extent to which our employees are making effective use of technology"

The first of these requirements is being used to justify continued investment in process-based applications such as expanding further the scope and functionality of ERP

applications, and the second of the requirements is being used to justify investment in business process management applications and process logging.

The money machine

It is important to appreciate that IT vendors are driven by the need to make profits for their investors and not directly by meeting the requirements of their users. Once the base license is sold the vendor adds in additional functionality that enables them to justify to the systems purchasers (invariably in IT) an increase in the license fee. Once installed it is very difficult for an IT manager to accept that they made a mistake, and the application should be replaced by a competitor product. It does happen but very rarely!

An important and invariably overlooked factor in application implementation success is the requirement for training employees on how to get the best out of an application. This is not a one-off action at the time of implementation because

- New functionality is being released perhaps every three months which may only affect a particular group of employees.
- In the course of a year perhaps 10-15% of the employees of an organisation will leave and need to be replaced.
- Another cohort will move to new positions that may require a different set of functional components.
- Incoming employees used to a particular application may

> find the transition to another vendor especially challenging because they need to 'un-learn' previous ways of completing a task.

These training costs are usually accommodated in department budgets and may have a significant impact on departmental financial performance.

In the healthcare sector the productivity issues are similar but the focus on the extent to which they are being used shifts from monitoring the use to achieving required levels of patient care and patient safety. This output element is largely missing from ERP implementation.

Even with an expansion of ERP functionality there are still many applications in an organisation where the content of the process, rather than process completion, are of significant importance and this is one of the catalysts for creating a digital workplace.

Digital workplace technologies

At one time it seemed likely that the office of the future would be managed through Enterprise Information Portals (EIP), announced with some fervour by Merrill Lynch in a market report in 1998. The marketing pitch was that Enterprise Information Portals were applications that enabled companies to unlock internally and externally stored information and provide users a single gateway to personalised information needed to make informed business decisions. There was an initial avalanche of vendors offering these

applications but they failed to gain any momentum. The reasons for this include:

- No attention was paid to how work was being performed
- Very limited search capabilities
- Cluttered and complex user interfaces
- Limited integration between applications and repositories
- Invariably no linkage between IT and business operations.

The late 1990s also saw the emergence of intranets, which at that time, and since, are often an example of shadow IT. Over the last two decades there has been an on-going discussion about the extent to which an intranet can offer digital workplace capabilities, a discussion accelerated by the advent of remote and hybrid working.

There is a general recognition that intranets need to support work tasks but there is a substantial challenge in identifying these tasks, especially when they take place outside of the office environment. The intranet may only be providing some of the information needed to undertake the task which may in fact be carried out using an application (such as product data management) that is rarely integrated into the intranet.

Although intranets offer access to enterprise applications

this may well be on a read-only basis and the management of security permissions for these applications can be challenging.

The Covid pandemic has caused organisations to move rapidly to support remote work to an extent that Bier could not have foreseen. Employees expect the same level of support and information access independent of location, and this also holds true for support. The expectation of employees is that a digital workplace should be intuitive, but this is very difficult to achieve when organisations of any size are making use of a wide range of business applications, often from a range of both global and local suppliers and with content in an equally wide range of languages.

A digital workplace has to offer not only task support and integration with at least some enterprise applications but also has to support both asynchronous and synchronous communication and collaboration. This is the business opportunity that Microsoft in particular has targeted with great success over the last few years, though perhaps 'success' is probably best defined in terms of market share than in user satisfaction.

Another factor in the development of the digital workplace is the focus on data sharing. The options are well presented in an analysis by the Boston Consulting Group, which illustrates well the increasing complexity which comes with the business requirement to share data as widely as possible across the organisation.

Digital systems complexity

The purpose of setting these issues out at this point in the book is to highlight the digital complexity of the business (and clinical) environment. In an ideal world these systems should be intuitive to use but that vision is not achievable. Little account is taken of the impacts of employees changing jobs (and therefore screen layouts) and joining an organisation with no knowledge of the way the organisation works.

The pressure on each employee to deliver is immense and immediate, as evidenced by the rapid adoption of business process management applications, the scope of which is to monitor the extent to which an individual process is being carried out by an individual employee.

A factor that is rarely taken into account is the importance of supporting employees with a range of physical and cognitive disabilities. By far the most common of these is dyslexia, which is a spectrum condition with an incidence of perhaps one in ten of employees. The concept of workarounds is at the core of employees being able to cope with an environment that often (to them) seems to be designed with no thought about accessibility despite there being an ISO standard (ISO 9241-11:2018) and the WAG accessibility guidelines.

Customisation and personalisation

In the context of a discussion about workarounds it is important to recognise the role of customisation and personalisation of enterprise systems. Definitions of these vary but for the purposes of this book

- **Customisation** is the process of creating interfaces and routines which meet the specific requirements of a group of employees with either similar roles or undertaking similar processes.
- **Personalisation** is enabling an individual employ to create an interface and routine which meets their specific requirements, perhaps taking advantage of their prior experience and expertise in both their role and in the technical applications they are using.

Both of these capabilities raise the issue about the extent to which a customisation, and in particular a personalisation, is the result of employee innovation at one end of the spectrum or employee frustration at the other end.

The way in which an individual employee will go about a specific task depends on (in no specific order)

- Training on the current best practice on undertaking the task.
- Experience gained directly from undertaking the task.
- An appreciation of where the task sits in relation to both up-stream and down-stream tasks.
- The objectives that they have been set and evaluated on, including the extent to which they have been involved in setting these objectives and rewards.
- Feedback from colleagues and team members about the way a task has been undertaken and delivered.

- Experience in the organisation and its culture.
- Experience gained on similar tasks in a previous employment.

This brings workarounds into the centre of the discussion. To what extent is a perceived workaround actually an employee making use of the capabilities of the application to enhance their personal contribution to achieving both the objectives of the organisation and also their career aspirations?

The dark side of the digital workplace

The hype around the 'digital workplace' from vendors skates over the dark side of their impact on employee welfare, especially their mental health (Marsh 2022) and much work remains to be done to clarify the issues and the solutions. A particular issue is that of dyslexia, which is a spectrum condition which has an impact on readability, comprehension and memory (Spark-Smith 2022). In a physical environment employees with dyslexia often had colleagues sitting close to them who provided a workaround with the comprehension of documents. This workaround is now more difficult to call on in remote and hybrid working. Voice output can help to a degree but assumes that the underlying HTML code is well written.

Employees with dyslexia, and indeed with other conditions which render content items partially or totally inaccessible are highly likely to try to develop their own personal workarounds

to the challenges posed by an all-encompassing digital workplace. (Beetham 2017, de Beer 2022).

The incidence of dyslexia in the general population is probably 10%. It may be less in an organisation as a result of the barriers to entry and career development that may unfortunately be present, but even at the 5% level the opportunity and encouragement to develop workarounds is quite substantial.

Who owns the digital workplace?

This is probably the most difficult question to answer in any organisation. The IT department will own the applications. Lines of business will specify process requirements and success factors. HR departments and training managers will be aware of the requirements to train employees. But there will be no owner responsible for bringing all the elements together and reporting to the Board even though the implications for productivity, performance and profit are all tightly linked to the way in which the employee can use and benefit from the digital workplace. (In passing, I would note that this is the identical problem with enterprise search applications.)

Without an owner there is no final arbiter of whether a workaround has a benefit to the organisation or is having a negative effect. Without that transparency there is no psychological safety and no innovation.

The bottom line

Despite the levels of investment into business process management and process mining these represent only a

particular category of business processes. Identifying workarounds in a digital workplace environment is significantly more challenging as knowledge workers create content by working with other employees to gain knowledge and validation. Certainly process mining of text documents can be used to capture data for inclusion in a business process but it relies heavily on the structure of the fields and content of the document. In Chapter 11 some of the potential impacts of AI on workaround development are considered, though the true impact may not become apparent for some time!

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11.

WORKAROUNDS - THE CHALLENGES OF AI

In this chapter

The rate of development of AI-based applications, and in particular generative applications such as ChatGPT make for a very cloudy crystal ball. In this chapter some of the potential impacts of AI on workarounds and shadow IT are considered but there are many issues which remain poorly defined.

AI comes centre stage

When I drafted the outline of this book in July 2022 I included a chapter on AI in which I could consider the implications of machine learning on the propensity for employees to use workarounds. I decided to leave the chapter to the end of the writing process as the rate of change in the adoption of AI routines into enterprise applications was already quite significant.

An important contribution to assessing the impact of AI on business has been made by Alter (2022) building on his considerable experience tracking research on business processes and based on a work system life cycle model.

Then came the release of GPT3 and ChatGPT by OpenAI,

supported in enterprise adoption by Microsoft, a joint-venture partner of OpenAI. Now GPT4 is available and there have been some significant changes to ChatGPT as well as the release of (at this point in time) over 20 other applications based on Large Language Models (LLMs). The underlying technology as far as language management is concerned is not 'new' but what has happened is a step change in computing power. For a detailed description of how ChatGPT works there is a very comprehensive blog post from Steven Wolfram.

Because of the installed base of Microsoft Office, the launch by Microsoft in March 2023 of its Copilot application is a very significant development. Over the last two decades the roll-out of new functionality on Office, and on SharePoint and other Microsoft applications, has been generally slow and poorly posted in advance. Planned release dates have come and gone. The release of Copilot can only be described as a total change of strategy.

To quote from Satya Nadella, Chairman and CEO, Microsoft

"Today marks the next major step in the evolution of how we interact with computing, which will fundamentally change the way we work and unlock a new wave of productivity growth. With our new copilot for work, we're giving people more agency and making technology more accessible through the most universal interface — natural language."

In the initial product announcement Microsoft seeks to reassure its customers

"Copilot will fundamentally change how people work with AI and how AI works with people. As with any new pattern of work, there's a learning curve — but those who embrace this new way of working will quickly gain an edge."

In the course of the deployment of new enterprise technology over the last four decades vendors may have provided some degree of training on new applications but usually on a 'train-the-trainer' basis. The full functionality of enterprise applications is usually only required by a relatively small percentage of the total workforce, with most employees using screens and procedures specific to their particular roles and tasks. Even so implementing these applications comes which major challenges, outlined in Chapter 5.

Implications for employees

The scope of this book is restricted to the occurrence and management of workarounds and shadow IT. At this stage there is no feedback from early adopters, and when there is, the question that is inevitably raised is the extent to which Microsoft (and other vendors offering similar LLM-based applications) have provided a level of support in implementation which will not be available to the next level of customers. There is also of course very little academic research to call upon. A notable exception is a paper by Alter (2022) in which the author presents a work-system perspective that is built on his previous work. Although there is only a passing reference to workarounds the paper does discuss the potential impact of AI applications on the workplace.

It may be several years before the large-scale independent assessments of the impact of these technologies is published. There will no doubt be positive comments from the major IT consulting services firms but there is rarely the level of detail in their endorsements that would be of assistance to less-well equipped organisations.

Inevitably this chapter is based purely on conjecture, and all that I am able to do is to raise issues and not come up with solutions. However, the need to understand the implications for organisations of AI governance in health care has been recognised by NHS England with the publication in 2022 of Developing Healthcare Worker's Confidence in AI (NHS England 2022) which sets out an Advanced AI Education for Specific Archetypes. These archetypes are defined as

- Shapers
- Drivers
- Creators
- Embedders
- Users

This is a useful framework as it moves away from training for specific roles towards roles based on the ways in which AI is being adopted.

The document emphasises the scale of the training effort required to prepare employees for the increased use of AI

applications. This report focuses on health care professionals at all levels but in principle also applies to enterprise situations.

"Educating healthcare workers to develop, implement and use AI effectively and safely is a multidimensional challenge, involving undergraduate education, postgraduate training, and lifelong learning. The challenge is to provide the right resources to the right people and build skills and capabilities across the healthcare workforce in the most efficient and effective way possible.

This challenge demands an approach to educating and training for AI that is flexible, including a mixture of widespread acquisition of awareness and knowledge whilst also supporting specialist skills and capabilities to deploy and maintain these technologies. This means providing a solid foundation for developing AI-related knowledge as well as personalised advanced educational elements to fit the needs of individuals in different roles and responsibilities (the workforce archetypes)."

Along similar lines a team from the Turing Institute (Morgan 2023) has considered the developing concept of 'human in the loop', defined as 'human judgement at the moment an algorithm renders a specific prediction or decision'. This reflects the emerging need to recognise the importance of human intervention at a specific crucial point or 'moment' within the decision-making process to constrain or prevent a specific action.

As discussed in this book there are a range of initiators for workarounds which include

- Maintaining personal productivity at the level expected by the organisation
- Simplifying complex IT systems
- Reducing psychological stress
- Retaining a sense of being in control of IT systems, not being controlled by the system

The issue is whether or not novel (in terms of there being no precedent) AI systems are going to alleviate these initiators or increase them. Microsoft's claim is that Copilot promises to unlock productivity for everyone. To back this claim Microsoft reports that among developers who use GitHub Copilot, 88% say they are more productive, 74% say that they can focus on more satisfying work, and 77% say it helps them spend less time searching for information or examples. No information is provided as to how the productivity of developers scales to the productivity of 'everyone'.

Another statement by Microsoft suggests that

With Copilot in Word employees can jump-start the creative process so that they never start with a blank slate again. Copilot gives then a first draft to edit and iterate on — saving hours in writing, sourcing, and editing time. Sometimes Copilot will be right, other times usefully wrong — but it will always put you further ahead.

I personally find that the concept of a system being usefully wrong is difficult to accept. For it to be usefully wrong the human in the loop has to know what is correct.

There is a tendency on the part of vendors to see all digital workplaces as having similar processes and similar cultures. Williams (2018) makes an important point in presenting the outcomes of research suggesting there are six different types of digital workplace designs. The authors suggest that there are three people-focused designs supporting different levels of sophistication of interaction between people working together to create and share information, and three process-focused designs supporting joint work towards business improvement projects and integration with business processes and with other enterprise systems.

A workarounds perspective

At the time of writing this book in mid-2023 there is a tremendous amount of hype about the potential benefits of using applications such as ChatGPT to enhance the productivity of individual employees. There are already many examples of how these applications can create summaries of documents and the outcomes of meetings, develop press releases and provide high-quality translations. The underlying business case for the adoption of these applications is that they will enhance the productivity of employees and the organisation. There is also good evidence that these applications can create software code, which could lead to an increase in Shadow IT use.

The outcome could be that workarounds increase in number and scope because of the potential of these applications to generate content that is indistinguishable from content created by the employee. It is becoming clear that it is difficult for other employees and the organisation itself to identify whether a specific item of content has been machine, not employee, generated. This brings with it the risks that decisions are made on content for which there is no audit trail back to an individual employee. These risks will be of considerable concern to the clinical sector where time pressures are already very considerable to respond quickly to the medical needs of a patient.

It is still unclear about the ways in which AI technology will be embedded in the enterprise or clinical application. The resultant complexity of the application could make it more difficult for an individual employee to create workarounds but also may reduce the requirement to do so. The second scenario is that the sophistication and complexity of the application means that employees have increasingly less ability to create workarounds to tasks that remain unfit for purpose, and this could increases the stress on the employee.

The bottom line

The next few years are going to be very challenging for organisations as they adapt to the widespread adoption of AI applications. I will leave the last word (for now) to Aleksandr Tiulkanov who provides a balanced proposition for any organisation facing an uncertain future in adopting AI, as well

as highlighting the importance of risk management with AI applications.

To quote from his blog

"Let's assume you've identified a use case where employing a certain AI system seems to make sense. Let's further assume that the apparent benefits outweigh the downsides for you — and, importantly, for other people.

In this case, I would still think about the following points, especially for high-stakes decisions:

- *Are you using the right kind of technology for the job? What evidence do you have the technology use in this case is science-based and actually makes sense?*
- *Are you competent to verify the quality of outputs the technology produces? Objectively competent, as certified by diplomas, tests, peers, and people who pay you money for this as your work. If you're not paid for that, you're not a professional and thus not competent to verify the technology's outputs.*
- *Are you comfortable taking legal liability and moral culpability for any missed errors in the technology-generated outputs? The question is relevant whenever you use these outputs in real life and this might affect someone besides yourself.*
- *Aren't you over-relying on the technology, trusting it blindly, because of automation bias? Algorithmic outputs may seem authoritative, and research shows you might*

even disregard evidence to the contrary. How are you making sure this is not the case?"

Issues of risk management and technical debt management are considered in Chapter 12.

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12.

RISK MANAGEMENT AND TECHNICAL DEBT

In this chapter

Workarounds and shadow IT both create risks for the organisation and could result in an increase in the technical debt in IT development. Both risk and technical debt are very difficult to quantify but that does not mean they can be ignored. Risk management is especially important in clinical systems where patient safety and optimum patient outcomes are of the greatest importance. This chapter provides an overview of both risk management and technical debt.

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Managing corporate risks

Organisations take risk management very seriously. There is usually either a formal or implied requirement on the Board from shareholders to manage the organisation in a way that minimises the risk to their investment being reduced in value. This is well demonstrated in the SEC 10K annual filing of US quoted companies where Section 1A lists out risk factors. In most organisations there will be a designated risk manager who monitors the state of operational risks from both internal

and external perspectives and reports to the Board on a regular basis.

The potential impact of these risks is usually assessed through some form of scoring of the risk. At the most basic level the scoring is based on the product of the probability of the risk and the impact of the operation. The probability might be given a score of 1 – very unlikely to occur up to 5 – highly likely to occur, with a similar scoring for the impact on the organisation.

The fundamental flaw with any scoring based on probability of potential occurrence is that in reality there is little quantitative information on which to base the decision. The impact on the business is easier to judge.

There are three further elements that need to be taken into consideration in the effective management of risk.

1. At what score should the potential risks be moved up through the management levels of the organisation for discussion and appropriate action?
2. The rate of change of a score over time needs to be considered.
3. There needs to be a discussion about the risk appetite of the organisation.

Against this background workarounds could represent a significant risk to the organisation. The focus of the developer and subsequent users of the workaround will be on a short-

term gain to them personally. The extent to which the workaround could put the organisation at risk is almost certainly not on their agenda, if only because the focus is on a single process and accomplishing it more effectively. The potential impacts on down-stream stages of a process may be invisible to them because they lie in a different business unit and/or are hidden behind access security.

Assessing the risk due to workarounds is especially difficult because of their invisibility. Indeed the importance to the organisation of identifying and managing risks is arguably the most important reason for a workarounds strategy.

The two tables below set out a suggestion for a scored assessment of the attitude of IT and of individual employees to the way in which workarounds (including shadow IT) are supported.

Corporate IT assessment

We have a corporate policy towards workarounds and shadow IT and have established good practice policies on their use.	5
We have identified high risk processes and applications and have engaged with employees to assess the current state and potential remediation of workarounds.	4
We have set up a task force to formulate a workarounds policy which includes employees from across the organisation with experience of workarounds.	3
We have had some internal discussions about how best to monitor the use of workarounds.	2
We have taken no action to consider the potential impact and benefit of workarounds.	0

Employee assessment

The workaround I have developed has been documented with IT and shared and I have regular meetings with IT and my business manager.	5
My manager has approved my workaround and we discuss its value on a regular basis.	4
I have developed a workaround but I have not shared this with my manager.	3
The applications I use are not really fit for my purposes but there is no procedure for me to suggest changes.	2
Not using the approved interface for the applications is regarded as a misdemeanour.	0

The appearance of 0 in the final line of each table is not a misprint! If that is the employee score and yet corporate IT has a more positive score then the product of the two is zero as an indication of a lack of communication and transparency.

Workarounds and trade-offs in information security

This is the title of a very detailed review of the ways in which workarounds can give rise to corporate risks. Woltjer (2017), based on a very thorough review of the literature, differentiates between

- Workarounds as actions that are performed when the IS policy does not specify what to do, denoted by the author as 'workaround-as-improvisation.'
- Workarounds as actions that are done because of

> perceived gains in other work goals such as effectiveness, efficiency, safety, integrity or work quality, which are perceived as non-compliant to IS policy, which the author denotes as workaround-as-non-compliance.

According to Google Scholar there are only 22 citations to this paper since it was published, and a review of these shows that these citations are to papers primarily on information security policy development and compliance and not specifically to the risks associated with workarounds.

The notable exception is Slabbert (2022) who discusses the specific issues of the risk created by information security workarounds and develops a matrix of risk assessments. In principle these could be extended to applications other than information security but this is not the focus of the thesis. Essi (2023) provides a detailed review of the literature on the security issues of workarounds and also offers a categorisation of workarounds based on this review.

Internal and external compliance

An important issue with assessing the risk associated with any specific process is the extent to which the process is subject to external compliance. This is a major challenge with accounting systems where there will be an internal audit ahead of the external audit for any organisation publishing its accounts.

This issue has been considered in some detail in a series of papers by Drum (2016, 2017) in which the impact of

workarounds in accounting can result in very visible risks to the organisation.

Impact on ISO 9001 certification

At the core of ISO 9001 for quality management is that consistent and predictable results are achieved more effectively and efficiently when activities are understood and managed as interrelated processes that function as a coherent system. If these processes are not managed as a coherent system because of workarounds then certification under ISO 9001 is at risk.

ISO calls out a set of actions that an organisation should be taking to achieve and maintain ISO 9001 certification, including

- Defining objectives of the system and processes necessary to achieve them.
- Establishing authority, responsibility and accountability for managing processes.
- Understanding the organisation's capabilities and determining resource constraints prior to action.
- Determining process interdependencies and analysing the effect of modifications to individual processes on the system as a whole.
- Managing processes and their interrelations as a system to achieve the organisation's quality objectives effectively and efficiently.
- Ensuring the necessary information is available to operate and improve the processes and to monitor,

analyse and evaluate the performance of the overall system.

- Managing risks that can affect outputs of the processes and overall outcomes of the quality management system.

At one stage in my career the firm I worked for was audited for its conformance to ISO 9001 as this was critical to its professional reputation. The preparation for the audit uncovered a substantial list of workarounds where employees had not fully completed the document or had done so by cutting and pasting content from a document for Project A into the related document for Project B. The firm passed the audit though with a number of advisory notes from the audit team. The outcome of the audit process was a substantial improvement in the quality of the project documentation achieved by a considerable amount of training and more frequent internal auditing. Barata (2015) presents an approach to assessing risks in the implementation of ISO 9001.2015 which has more of a process approach than earlier versions of the standard.

Impact on ISO 27001 certification

Another business critical certification is that for ISO 27001 compliance on information security. Hybrid working inevitably introduces workarounds as employees working from home find that processes that worked well in an office environment with networked computers carefully managed by experienced IT security staff can not easily be implemented in

a home or other remote environment. This is especially the case with the transfer of files using USB devices, which in a physical office setting are often locked down.

Clinical risks

Compared to the situation in an office environment the potential risk to the well-being of patients in the context of Electronic Health Record applications is an order of magnitude more important and more challenging, primarily because the risk rating could change in minutes, if not seconds, as a patient (for example) has an adverse reaction to a drug which was not correctly recorded on the EHR application.

However it has proved to be very difficult to identify research that specifically considers the risk of workarounds in a clinical setting. There are a significant number of research papers on risk assessment of clinical procedures but from the search result alone it is not possible to distinguish research specifically on the risks associated with workarounds and shadow IT in clinical settings. The exception is an extensive narrative literature review of 220 papers by Baillette (2022) on the impact of Shadow IT in healthcare,

Technical debt

Technical debt can be defined as the design or implementation components that are useful in the short term but can make future change more costly or impossible. The phrase was proposed by Walt Cunningham in 1992 but it is only over the last decade that any significant attention has been

paid to the topic. Lennarduzi (2021) has published a comprehensive literature review.

Technical debt has a significant number of elements which are set out by Alves (2014) with the elements which have specific relevance to technical debt highlighted in bold

- **Architectural**
- Build
- Code
- Defect
- Design
- **Documentation**
- **Infrastructure**
- People
- **Process**
- **Requirements**
- Service
- Test Automation

The use of the term 'debt' in the description might be taken to mean that it is possible to develop a financial metric for the scale of the debt. At a top level it can be defined as a ratio of the cost to fix a software system [Remediation Cost] to the cost of developing it [Development Cost]. This ratio is called the Technical Debt Ratio [TDR].

However the debt metrics are arguably different for each element and cannot be consolidated across multiple elements.

Large corporate IT departments will have developed their own approaches to technical debt but may not have taken into account technical debt related to workarounds, shadow IT and software development.

The bottom line

The very nature of workarounds and shadow IT means that the risks they may generate could well be outside the compliance monitoring policies of the organisation. This situation inevitably increases an overall assessment of IT-related risks. Finally Chapter 13 takes a high level view of the topics discussed in this book

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13.

THE PAST, THE PRESENT AND THE FUTURE

In this chapter

This chapter brings together the outcomes of the individual chapters of the book within a broad chronological sequence that considers the past, the current state of affairs and the future impact of workarounds and shadow IT. Potential areas for further research are suggested and recommendations made for the actions that organisations should take to keep the benefits and risks of workarounds and shadow IT in balance.

The past – how we got to where we are today

The starting point is the establishment of the due process of law in 1368, which for the first time set out that a process had a number of defined steps which had to be worked through sequentially to the conclusion of the court case. Since that time, lawyers have spent a considerable amount of time working out how to use the process of law to best prosecute or defend their client.

Exactly how and when the term 'workaround' was first used is lost in time but certainly it was in common usage in the US aerospace industry in the early 1960s, reaching a pinnacle of

public awareness in the way in which NASA managed to bring the damaged Apollo 13 space craft safely back to earth.

The adoption of the concept from an academic research perspective dates back to 1984 and the work of Les Gasser on how the need to 'work around' (interestingly he did not use 'workaround' in his paper) the challenges of complex enterprise IT applications needed to be recognised and managed. The fact that there are currently over 750 citations to Gasser's work is a testament to his appreciation of problems that users of enterprise IT applications would be faced with and the scale of subsequent research.

At around the same time the way in which office work would be changed by the advent of IT (notably personal computers at that time) was being considered, and concerns raised about the potential gaps between fitness to specification and fitness to purpose.

Little research was carried out into enterprise application implementation and use in the period between 1984 and around 2012. By then it was becoming painfully obvious that implementing enterprise-wide applications (notably for enterprise resource planning purposes) was a far from straightforward task. One summary of the situation referred to 'clumsy implementations' (Newall 2007) and that is a fair description.

These were also the early days of Enterprise Health Record (EHR) applications, initially mainly in the USA as a result of US Government support. Implementation issues were made

more challenging as the change was effectively from paper to digital.

By this time there was an awareness that IT applications could be designed to meet a functional specification but meeting non-functional requirements (primarily related to adequate usability) was a much greater challenge. The gap between functional and non-functional was being met by workarounds and shadow IT. Workarounds were being developed by individual employees to enable them to achieve acceptable levels of productivity without the stress of working with an application which was difficult to use. The concept of shadow IT emerged in 2012 as the use of IT applications which had not been authorised by corporate IT. Arguably shadow IT is a workaround but a workaround might not involve shadow IT.

Two important pieces of research were being undertaken in the early 2010s by Van der Sharft-Bartis (2013) and Alter (2014). Alter was focusing on a definition for workarounds and whether the definitions could result in a classification of types of workaround that would enable IT managers to manage them. Sharft was also exploring approaches to the definition of workarounds but of perhaps greater importance was her analysis of the ways in which workarounds could be discovered, given that employees who had developed workarounds had incentives not to disclose them outside of a small group of colleagues. Among the discovery techniques was that of ethnography, which used carefully designed

interviews with users to explore the extent and use of workarounds.

At the same time EHR applications were starting to be quite widely adopted in the USA and a substantial amount of research started to emerge about the use of these applications and the incidence of workarounds as users struggled with what, to them (and to hospital IT teams), were very novel IT systems.

In many respects EIS and EHR applications gave rise to similar problems but some important differences were starting to emerge. Among these were the much wider integration of text (in the form of notes on treatments and outcomes) and the role of nurses in particular as a source of innovation in not only driving application development but being aware of the implications on treatment outcomes. This contrasts with the situation in enterprise applications where there is little involvement in employee-supported development of systems and a sense that workarounds should not be tolerated. The enterprise focus is on conformance to corporate policies and especially on improving productivity.

A common thread through both is a concern about data privacy. This is of course a major concern in the clinical sector but is also an issue in the enterprise sector around the identification of specific employees being tracked through data logging. This is not so much a GDPR issue as about the level of proof that a data logging application can give about the activities of an individual employee and how this information

might be used in assessing the performance and career development of the employee.

Interestingly the two communities seem to have no opportunity to learn from each other apart from the academic research literature which senior IT managers in enterprises are unlikely to have access to or an incentive to read.

It is in the nature of both workarounds and shadow IT that the incidence in the organisation will be unknown, though this is probably less of an issue in clinical applications because of a focus on supporting innovation. Any survey of a company is unlikely to arrive at even an approximate level of adoption. However, in the many case studies that have been undertaken, the choice of the employees to interview would have been made by the company as being representative of core business processes. It could be argued that this is close to a random sample and that if the interview programme reveals a substantial incidence of workarounds from a small group of employees then workarounds are likely to be endemic in the organisation.

In the case of both enterprise and clinical settings there is a strong commitment to reducing risks. In the enterprise these risks are related to conformance to internal standards and policies (such as ISO 27010 on information security) and to external audits for financial matters, as well as potentially an impact on corporate reputation. In a clinical situation patient wellbeing and positive treatment outcomes are monitored very carefully and reported to external agencies.

The problem for both environments is how the risks arising from invisible process workarounds and shadow IT can be quantified. This is especially the case with shadow IT which brings some substantial information security management implications – with workarounds this is less of a problem as the employee is using an approved application. It is important to realise that the risk from a workaround created by an employee may have a significant negative impact on a later stage of the process.

From an IT management perspective the implications for technical debt arising from workarounds has to be considered. Apparent issues with productivity or process integrity may catalyse development activity but if solutions have been developed as either workarounds or through the use of shadow IT then a change to the underlying application may not make any material difference and the opportunity to make such a change based on the experience of employees will be lost. Both will increase the technical debt of IT systems development.

A considerable amount of investment is now being made in Business Process Management (BPM) and Process Mining (PM) applications which track the course of processes in terms of chronology and keystrokes with the promise that the aggregated data will enable the enterprise to identify workarounds from differences in both.

There is a rule of thumb which suggests that 80% of the information in an organisation is unstructured text, video, social media, and images. The development of reports and

other documents is far less about conformance to a process that accomplishing a task, working through a procedure or making a decision.

The present – where we are today

We are really no wiser than we were a decade ago! Although there has been a substantial research effort into identifying and categorising the reasons why employees adopt workarounds and/or shadow IT it remains very difficult to identify what the top level issues are in an organisation that might catalyse workarounds and shadow IT. Data logging applications can provide evidence to indicate the likelihood of a workaround being used, but it does not generate a solution at either an employee, role or department level.

Of greater importance is a lack of awareness of the principles of effective information management. Even in organisations with a commitment to product and service quality there are rarely information management policies for information quality, nor an overall information management strategy. Information is supposed to flow around an organisation but invariably it does not and remains located in silos and team repositories.

There is a gradual understanding of the impact that psychological safety has in pushing employees to find ways of reducing the stress of their role and its requirements. It is a issue that has only comparatively recently been a research topic.

At the heart of the matter is the usability of complex

enterprise applications. No matter how close to the functional specification an application is able to be developed, the processes themselves will also change with time, business objectives, and now the large-scale adoption of generative AI applications.

Much of the credit for improving the usability of web applications lies with Don Norman and Jakob Nielsen, both of whom started working on user experience topics, coming together in 1998 to establish the Nielsen Norman Group. Employees are now well aware of what good usability looks like and are inevitably critical of enterprise applications that they judge to have poor usability.

The issues around identification and resolution are very rarely discussed at IT industry conferences and at conferences for the EHR community. There is certainly a significant amount of evidence and analysis in the academic literature, but only the clinical sector will have ready access to this research and the skills to read between the lines, and certainly no capacity at the present moment to undertake in-depth research into the situation inside their own organisation.

The clinical sector is marginally better placed than industry and the public sector because the risks related to patient outcomes are a daily concern to everyone in a hospital. Moreover the emerging emphasis on bringing nurses into the discussions around process improvement is very much a step in the right direction.

Meanwhile IT managers have to continue to support

rapidly changing business requirements and competitive threats through investment in new information systems. The benefits of these are invariably presented as complex schematic graphics which make no reference to the impact on employees.

It is now over 20 years since the core principles of a digital workplace were set out by Jeffery Bier and 40 years since researchers such as Suchman and Ellison raised the issues about how work would be undertaken in a digital environment. Now that the digital workplace market is dominated by Microsoft there is an assumption that all the requirements of a digital workplace are being met. There is evidence that this is not the case and that mobile devices and social media applications such as Facebook and LinkedIn are being used as workarounds to ineffective implementations of Office 365.

Workarounds as a source of innovation

A significant difference in the attitudes of enterprise and clinical management to workarounds is that in a clinical setting the importance of seeing workarounds as a source of system and process innovation is widely recognised even though there are some substantial cultural and management challenges in doing so. As an example, there are many research projects that show the benefits of nurses being involved in system design.

In the enterprise process optimisation seems to be driven top-down by the quantitative outcomes of data logging. Workarounds represent bottom-up innovation that may be challenging for an IT team to accept after the time that has

been taken in defining the processes and implementing the system. This argues for a much more agile development process and a much greater commitment to accessibility in its widest sense.

The future – a watchlist for potential research and management action

As I write this chapter in April 2023 the last few months have seen some dramatic developments in the availability of generative AI applications, such as ChatGPT. OpenAI has been in the vanguard of these developments and Microsoft (which has a substantial investment in OpenAI) is rapidly adopting the OpenAI technology in applications such as Copilot. The speed of availability is a complete contrast to the somewhat glacial approach to product development from Microsoft over the last four decades.

From a workarounds perspective, applications such as Open AI ChatGPT and Microsoft Copilot have massive implications. If the promise is to enhance productivity then employee job security has to be under threat. It is unclear how employees are going to be trained in the effective use of what are now generically referred to as generative AI applications given that these applications have the potential to be implemented very widely across an organisation.

Nowhere will training be more important than in information management. This training will need to be placed in the context of information governance so that employees have a benchmark for the way that they can make use of

generative applications and how this use should be identified in a document. The challenge here is that issues around information quality are not owned by a senior manager who can lead initiatives in assessing the potential benefits of generative applications. This is not a role for IT as to a significant extent employees will almost certainly be using applications which are not under the management of the organisation. ChatGPT and similar applications are in effect shadow IT and it is likely that younger employees will have a greater awareness of the potential of these applications through their widespread use of social media than senior managers using established applications and procedures.

The opportunities for research

In the course of searching through the research literature in writing this book a number of areas emerged where little, if any, research has been carried out.

Potential areas for research would include

- Making comparisons between the way in which workarounds are identified and managed in enterprise and clinical organisations.
- Considering the potential impact of psychological stress on the propensity for employees to adopt workarounds.
- Understanding how employees with neurodiverse conditions adopt workarounds.
- Undertaking case studies that focus on the background and experience of employees who are using workarounds

and shadow IT

- Assessing the value of data logging applications in identifying procedural workarounds where there are few data points for the way in which the content item progresses through the procedure.
- How best to integrate quantitative and qualitative discovery outcomes to arrive at an estimation of the scale and depth of workaround adoption.
- Understanding if EHR managers have the incentives and time to monitor the outcomes of academic research.

Recommendations for organisations

The management of workarounds and shadow IT is rarely discussed in industry conferences and in the computer press despite the likely scale of use in organisations of all sizes and in all sectors. This applies to both enterprise and clinical practice. However, based on my experience in enterprise IT over several decades I would like to suggest some actions that organisations should consider taking.

- Recognise the value of combining top-down business process management routines with bottom-up process innovation from workarounds and shadow IT.
- Establish channels of communication through which employees and managers at all levels in the organisation can exchange views on the ways in which the need for workarounds and the adoption of shadow IT

applications have emerged and track the way in which the benefits and risks can be assessed and managed.
- Create an environment that supports and rewards innovation in process design, implementation and adoption.
- Introduce usability assessments of existing and pending enterprise applications.
- Agree a corporate information management strategy, with a senior manager (ideally reporting to the Board) tasked with ensuring that the strategy is implemented.
- Assess the potential risks of workarounds and shadow IT on customer-facing processes and on processes that are subject to external audits.
- Consider how to quantify risk and technical debt arising from workarounds and shadow IT within the risk management protocols of the organisation and its risk appetite.

An innovative starting point to assess the prevalence, nature and management of workarounds is a book from The Art of Service, an Australian publisher of a wide range of self-assessment books. The Workarounds edition (Blokdyke 2021) runs to over 1200 questions that map against a seven-point framework of Recognise, Define, Measure, Analyze, Improve, Control and Sustain.

The bottom line

When I started work on this book I had little idea about the

scale of adoption of workarounds and shadow IT nor about the significant amount of research that has been conducted on these topics. It has been a fascinating journey into areas that are rarely discussed at either IT industry events or events for EHR managers.

It is important to note that the outcomes of this research may well be largely invisible to enterprise IT managers who usually have limited access to this research (most of which is behind a subscription paywall) and equally limited time to consider the research in detail and take advantage of the outcomes in their organisation. This may be less of a problem in the clinical sector where the managers of EHR applications will be familiar with research.

The timing of the publication of this book could be fortuitous, in that during the course of writing it the role of AI in the work environment has been changed dramatically by the launch of generative AI applications such as ChatGPT. It is too early (perhaps by several years!) to assess whether these applications will increase or decrease the adoption of workarounds and shadow IT.

The only certainty is that unless organisations start to pay attention to understanding the extent to which employees have had to adopt unofficial ways to achieve their objectives they will have no baseline to know in which direction, and why, the usage has changed.

APPENDIX - RESEARCH RESOURCES

The research process

When I embarked on writing this book in mid-2022 I started out with a search on Google Scholar for the term 'workarounds'. Although there are some concerns about the coverage of Google Scholar I was able to identify a good initial collection of research papers. I am a member of the Association for Computing Machinery and so was able to carry out a search on the ACM Digital Library, initially focusing on ACM publications and then expanding it to the ACM Guide to Computing Literature.

As my initial collection grew in size I also adopted what is usually referred to as snowball sampling; working through the bibliographies in the papers I already had downloaded in order to identify similar papers.

More recently I have also used OpenAlex as a search application, which identified a number of papers that seemed not to have been indexed by Google.

Throughout the process of writing this book I have also used a search profile on Google for both 'workarounds' and 'shadow IT' and in a typical week the profile presents 10-15 titles. Although there are question marks about the indexing

of the scholarly literature by Google Scholar the use of the single search terms seems to have been effective.

I should also mention the Workaround Mining Lab of the University of Utrecht which is undertaking research projects and the annual Business Process Management conference

Deep Analysis is a consulting company based in the USA which publishes vendor profiles and market research analyses on business process management, process mining and information automation. Most of the reports are free of charge but registration is required.

It was never my intention to undertake a systematic review of the literature, and in selecting the papers cited in this book I have tended to provide links to papers with either substantial bibliographies and/or a significant number of citations.

Starting out on research into workarounds and shadow IT

If you are starting out on a project in this area I would suggest the following as a core list of references, but above all, start with Alter (2014) and Bartelheimer (2023).

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