Deliberate collaboration

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Many people have experienced the collaboration methodologies that I use or teach, but have never seen the underlying theory in use that informs these methodologies and drives me in practice. I believe that reflective practitioners can develop robust theories worth sharing and I hope mine makes a valuable contribution to anyone struggling with complex projects and organisational effectiveness. Thank you to Prof. Alet Erasmus for reviewing the white paper.

Abstract

This paper develops a practical theory of human collaboration from a practitioner's perspective that could be of value to anyone struggling to manage complex projects. The paper takes a systems approach in viewing projects and organisations as a conversation system, and integrates principles from distributed cognition and small world networks. The theory arose from a concern about persistent failure of organisational projects, particularly information technology projects, and a worry that mainstream project management has inadequate theory to inform viable methodology in complex situations.

The paper argues that the success of projects depends on the design of the conversations in which project commitments are made. It argues that contagious manageability can be achieved by redesigning the cognitive environment of the conversation system to create a small world where it is possible and easier to achieve a workably accurate understanding of 'what is going on' in everyone's mind.

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Disclaimer

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Introduction

Whenever we find ourselves struggling with persistent problems, it is usually the theories that we rely on that let us down. As Kurt Lewin said, 'there is nothing so practical as a good theory' (Lewin, 1952: 169). A good theory enables us to understand, predict, and master situations we need to manage, and when our lives are manageable, we can cope and have a chance at happiness. If the theories we depend on are flawed or missing altogether, we struggle to cope and life can seem unmanageable. In this paper, from the perspective of a reflective practitioner, I will develop and describe the theory-building process of a practical theory of collaboration, and explain its value to create manageability in complex situations I have had to manage.

A struggling industry

I am interested in manageability because I worked in a struggling industry for 20 years. During the 1980s and 1990s, I worked in information technology (IT) – initially as a computer programmer and later as a systems analyst and project manager – developing and implementing software systems for large organisations. When I started in the industry around 1980, 15% of software projects around the world were complete failures (DeMarco, 1982). The industry responded by investing in project management and software development methodologies. These methodologies grew voluminously in an effort to improve the reliability of software implementation. Instead of improving, the situation deteriorated, and by the mid 1990s, worldwide failure in software projects had grown to around 75% (Standish Group, 1994). I became demoralised and started to question the methodologies, wondering if they were causing more harm than good. Twenty years later, nothing much had changed, with only 29% of IT projects considered successful (Standish Group, 2015).

What methodologies told us

The methodologies told us how to manage our projects, but I started to worry about manageability as the methodologies seemed to assume that our projects were manageable from the beginning. They provided tools and techniques for gathering requirements, assuming the existence of predefined business rules. For example, if the business rule is to apply a 5% settlement discount on invoices paid within 15 days, then there is no problem programming this into an IT system. However, the business struggled to determine new rules while the IT system was being designed, causing confusion. I often found myself embroiled in dysfunctional conversations fraught with dilemmas, disagreements, and prevarication while the business agreed elusive business rules. These conversations fell into a grey area, where business and IT were both ill-equipped, and the usual default was to see it as a 'systems issue' to be delegated to IT. The collaboration between business and IT often seemed dysfunctional and unmanageable.

Project Management Body of Knowledge

Many of my colleagues in the 1980s and 1990s would be familiar with the Project Management Institute's (PMI, 2000) Project Management Body of Knowledge (PMBOK). This is the gold standard methodology that epitomises mainstream project management and is the text that people must study to become accredited PMI project management professionals. The PMBOK is not exclusive to IT projects and is a mainstream methodology widely used by project management professionals in many industries. It is significant that the 2000 edition of the *PMPOK Guide* does not mention the word 'collaboration' in the index, nor covers collaboration as a topic essential for successful project management. There is a short chapter on communication, but nothing on facilitating conversations necessary to agree on decisions. Decision-making is covered in a single paragraph. Collaborative decision-making is fundamental to project success and I wondered why the methodologies did not provide any help with this.

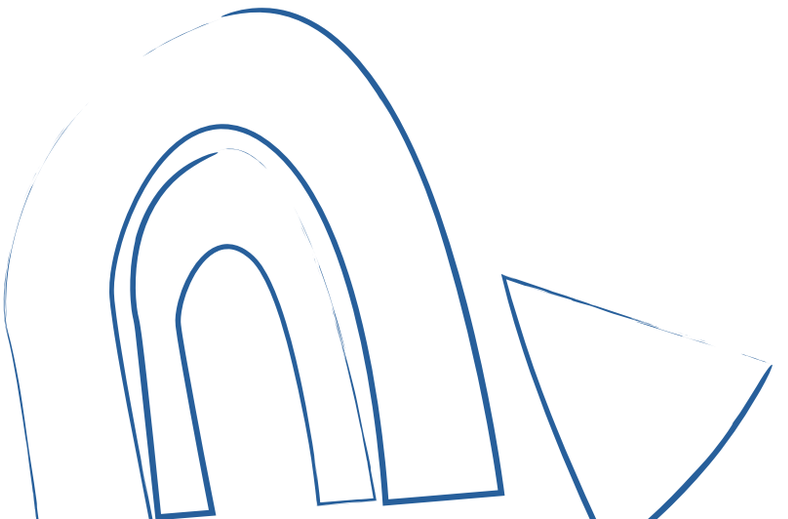
Shortcomings of the Project Management Body of Knowledge

Surprisingly, 'theory' does not appear in the index of the 2000 edition of the *PMBOK Guide,* nor is there a chapter covering project management theory. A profession should be founded on solid theory, which I searched for in vain. Eventually, I found a paper delivered at a PMI research conference that began: 'In prior literature, it has been generally seen that there is no explicit theory of project management' (Koskela and Howell, 2002: 293). The paper further describes efforts to extract the theoretical foundations *implicit* in project management as espoused in the PMBOK, and concluded: 'This foundation is obsolete and has to be substituted by a wider and more powerful theoretical foundation' (Koskela and Howell, 2002: 293).

The paradigm shift

By the time I read the above-mentioned paper (Koskela and Howell, 2002), I had already experienced my own paradigm shift while conducting my PhD research, titled *The design of collaborative projects: language, metaphor, conversation and the systems approach* (Day, 1999). I felt vindicated having already responded to their call for action by developing 'a wider and more powerful theoretical foundation' of my own.

So far, I have been describing my struggle in the IT industry during the 1980s and 1990s, unpacking some questions that motivated my research into the design of collaborative projects (Day, 1999). I was looking for a practical theory that would enable me to create manageability in the complex projects I had to manage.



Action learning

I am continually surprised that so many people struggle to distinguish *theory* from *method*. For instance, I have taught collaborative project management to master's students who know the PMBOK inside out, yet never realised that it is a methodology, not a theory. Figure 1 clarifies the distinction.

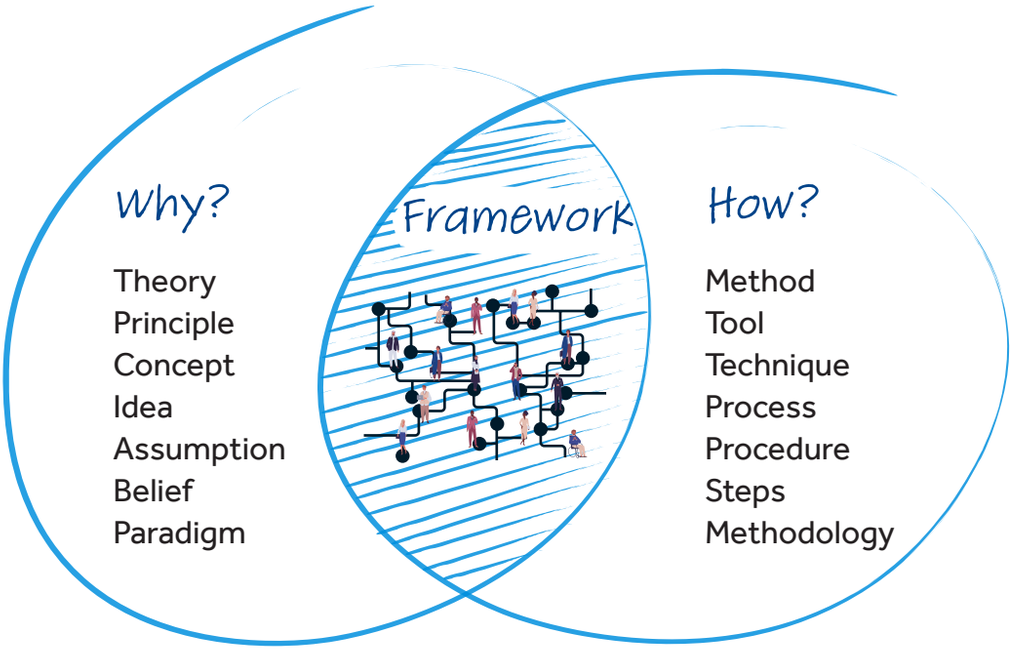
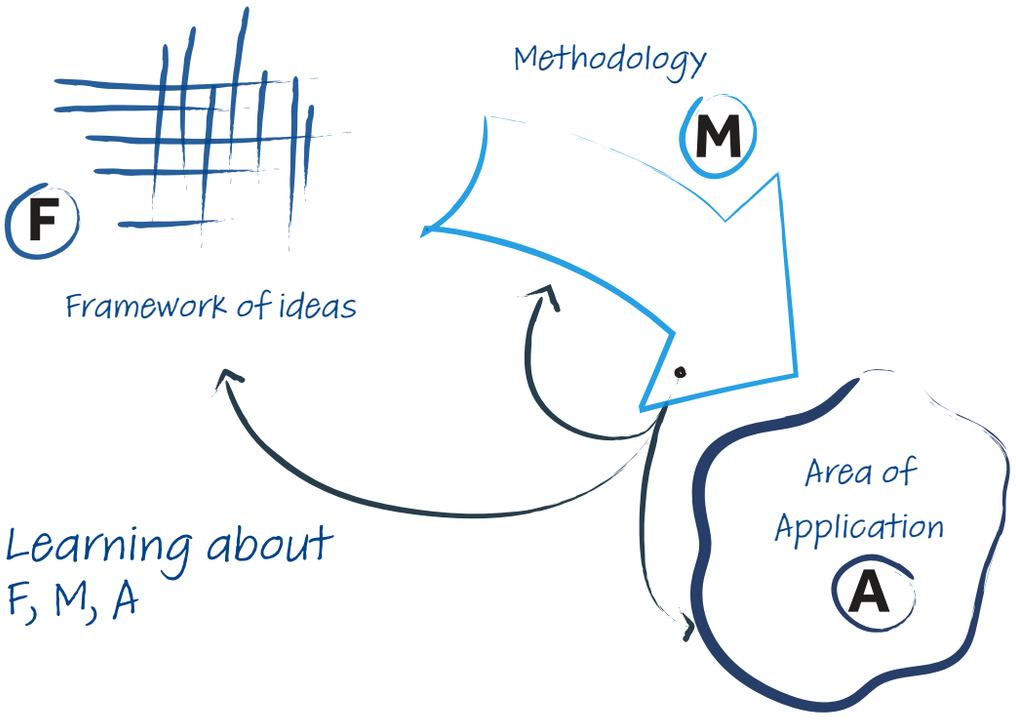


Figure 1: Theory versus method
Source: Own design

I developed my PhD using Checkland's FMA model for action research, depicted in Figure 2. Checkland believes that we learn by testing Methodology derived from a declared-in-advance Framework of ideas, and applied to an appropriate Area of application (Checkland and Holwell, 1998).

I believe that action learning is 'strong' when we test, question, and revise the theories that inform methods. We need to understand 'why' (the theory) in order to have confidence in 'how' (the method).

Checkland's FMA model



Handy's learning wheel

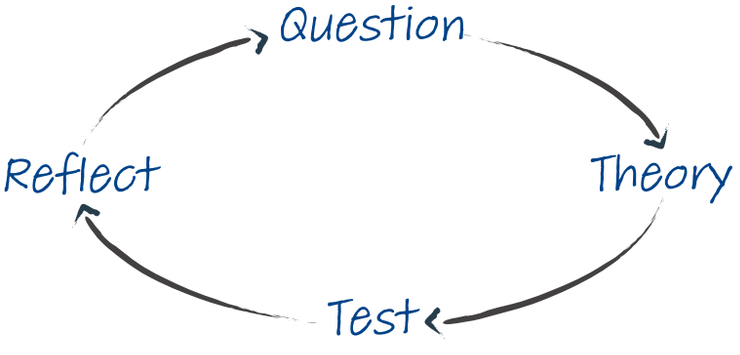


Figure 2: Action research
Source: Checkland and Holwell (1998); Handy (1991)

Action learning is iterative, as represented by Handy's learning wheel (refer to Figure 2). Moreover, Handy believes in testing *declared-in-advance* theory and consciously reflecting on experiences in order to learn. The model shows that questions can evolve and learning is about rethinking questions as understanding evolves (Handy, 1991), which was my experience. I had no idea the extent to which my original question would evolve and open up so many unexpected paths of inquiry.

When I began my action research, I asked: 'How can we prevent project failure in the IT industry?' This revealed the importance of collaborative conversation, leading to experiments with conversation design, which led to experiments with collaboration design, and ultimately to answering an entirely different question from the one I started with: 'How can I design productive collaborative projects in complex situations?' This question is relevant to all industries, so I am now able to operate beyond the narrow boundary of IT

Reflective management practice

On graduation day, my PhD supervisor said, 'Now your learning can begin.' How right he was. For the next 20 years, my challenge was to make my theory of collaborative projects practical for everyday use. I was no longer doing formal action research, but I still needed to keep on learning to figure out exactly how to add value to people struggling with collaborative projects. Who do I talk to? How do I talk? How exactly will I operate? What are my services and products? Where can I add value? These questions necessitated ongoing learning to boost self-belief and confidence, while understanding that I must add significant value to clients every time I work.

Believing that you are only as good as your last job exerts powerful pressure to keep on learning.

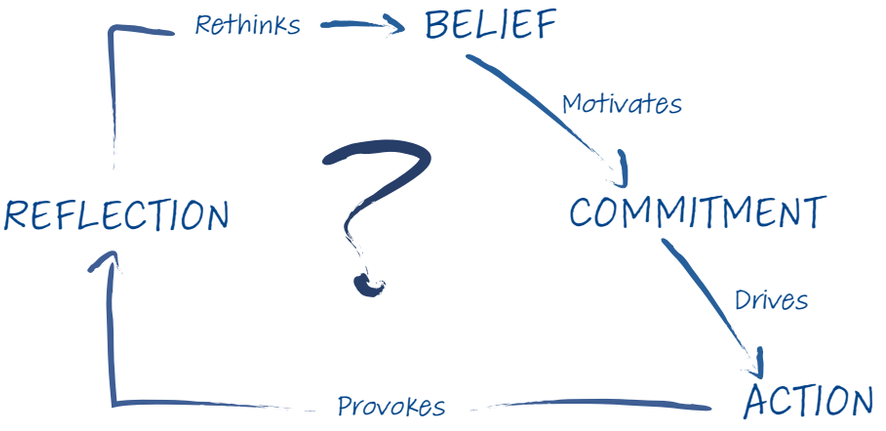


Figure 3: Manager's action learning model
Source: Day 2019

I believe management is an action learning process. Figure 3 shows a generic action learning model I developed for anybody who needs to manage anything. The quicker we learn, the quicker we win, so we need a model to drive reflective management practice. Action learning revolves around a question that can evolve as we learn from positive and negative experiences. The model emphasises execution, that managers need to 'get things done'.

Without belief, there is no motivation to commit; and without commitment, there is nothing to drive action.

The action learning model asks managers to rethink *belief* as opposed to *theory*. Although these words have similar meanings and are almost interchangeable, I think that belief is less intimidating for practitioners. The more people we have in a situation, the more complex it becomes because multiple perspectives may diverge significantly, yet all be legitimate. It is difficult to make joint decisions under these circumstances and projects fail when there is a lack of agreement or no shared belief. Implementation requires sufficient shared *belief* to motivate *commitments* necessary to drive *action*.

Practical theory

The theory for collaborative projects that I developed in my PhD represents my *espoused theory,* fresh in my mind in 2000, but not the *theory in use* that guides me now in practice. My espoused theory of collaborative projects is a comprehensive systems model, covering many variables and numerous interactions between them. It was important for me to understand the system dynamics of collaborative projects, but as a practitioner, I now find the model cumbersome, although it is still there in the background and has done its job. My current theory in use has evolved in the last 20 years and I will represent it according to Einstein's dictum of 'Everything should be made as simple as possible, but no simpler'.

Figure 4 represents a theory of collaboration in 'deep simplicity' (Gribbin, 2004). It shows the principles that have stood the test of time and served me well, which have reinforced each other systemically and are embedded in my mind as a cohesive whole, without causing cognitive overload. This is the theory that I strongly believe in right now. From a pragmatic perspective, I am much more concerned with whether it works for me in practice, than whether it is academically correct. My practical learning might lag behind current research. So, as a reflective practitioner, I offer this theory in deep simplicity as my contribution to knowledge.

I have a taken a systems approach to collaboration.

For the purpose of this paper, it is sufficient to conceptualise a system as a collection of parts that interact to function as a whole (Kauffman, 1980: 1). Inherent in the systems approach is the adage that the whole is greater than the sum of its parts, that the system has *emergent properties* that cannot be understood simply by analysing the parts of the system in isolation from the interaction between the parts. Human organisation emerges when people interact. We will never understand human organisation (the whole) merely by analysing people (the parts of the system).

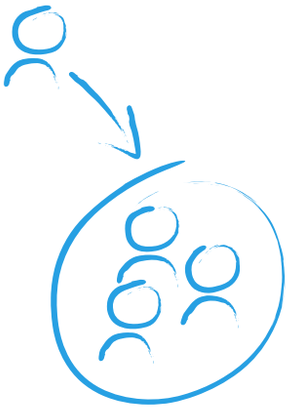


Figure 4 shows people, who make up the parts of the system, interacting to form a whole, which might be a family, a project, a team, an organisation, or a community. Collaboration involves people who think, talk, and act to make shared commitments to shared goals. To create manageability, we need to understand and integrate practical principles around thinking, talking, and acting. The theory triangulates principles of distributed cognition, conversation systems, and small world networks. For these three elements, I have attached statements from Edwin Hutchins (2000: xvi), Kenneth Boulding (1956: 45), and Stephen Strogatz (2003: 251) to provide an entry point to dig for deeper insights. Similarly, statements from Michael Tomasello (2006: 14) and Ludwig Wittgenstein (cited in Raban, 1999: 151) provide an entry point for contextualising human collaboration. My statements subsequently summarise my theory of manageability.

Collaboration:

'Only humans have the skills and motivations to engage with others collaboratively, to form with others joint attention in acts of shared intentionally.'
(Michael Tomassello, 2006: 14)

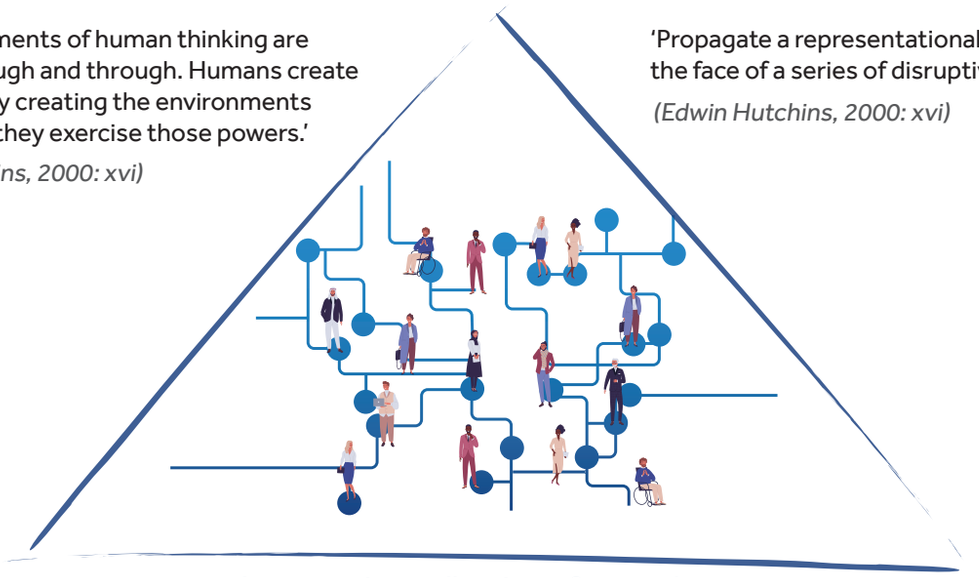
'The world we live in in the words we use.'
(Ludwig Wittgenstein cited in Raban, 1999: 151)

Thinking

Distributed cognition

'The environments of human thinking are artificial through and through. Humans create their power by creating the environments within which they exercise those powers.'
(Edwin Hutchins, 2000: xvi)

'Propagate a representational state in the face of a series of disruptive event.'
(Edwin Hutchins, 2000: xvi)



A system is a collection of parts that interact to function as a whole

Talking

Conversation systems

'The study of a man is the study of talk. Society is an edifice spun out of the tenuous webs of conversation'.

(Kenneth Boulding, 1956: 45)

Acting

Small world network

Anything that can spread- infectious diseases, computer viruses, ideas, rumours- will spread more easily and quickly in a small world.'

(Steven Strogatz, 2003: 251)

Manageability:

'Striving for 2nd order intentionality to create and re-create a workably accurate understanding of each others minds.'
(Julian Day, 2022)

'The world we live in is the representations we use.'
(Julian Day, 2022)

Figure 4: Theory of collaboration
Source: Own design

Human collaboration

Tomasello (2006: 14) framed collaboration as 'acts of shared intentionality' (Figure 4). Intentionality is a philosophical term referring to an entire mental state and how it is directed towards an object, situation or state of affairs. In simple terms, intentionality refers to the contents of our minds (Dunbar, 2004: 45).

Even though we are so closely related to chimpanzees genetically, there is a fundamental difference between the minds of chimpanzees and that of humans (Tomasello, 2006). Humans are mind-readers, giving us the ability to think about what other people are thinking. A chimpanzee knows what is going on in its own mind, but it does not have 'theory of mind' (Dunbar, 2004: 43) – that is, chimpanzees do not know that other chimpanzees have minds, so they do not know what they are thinking. Humans are excellent mind-readers and, at around the age of four, the human child becomes increasingly adept at understanding what is going on in other people's minds (Dunbar, 2004: 43).

If I say, 'Joe is angling for promotion', I am operating in second-order intentionality because I am thinking about what is going on in Joe's mind. If I say, 'Sue thinks that Joe is angling for promotion', I am operating in third-order intentionality because I am thinking about what Sue is thinking about what Joe is thinking. Human mind-reading is very sophisticated and we can operate in fourth- and fifth-order intentionality, even sixth-order is possible but mesmerising (Dunbar, 2004: 46). In general, the less mind-reading we need to do, the more manageable our lives. Chimpanzees come quite close to attaining second-order intentionality, not quite reaching the level of a four-year-old human. No other animal attains second-order intentionality, not even clever animals like dolphins (Dunbar, 2004).

Naturally, mind-reading can be inaccurate. Perhaps I am mistaken, perhaps Joe is not angling for promotion. We can see how confusion and misunderstanding can propagate. The remedy is meaningful conversation. Mary might say, 'Julian, you are mistaken. I have just spoken to Joe, and he is quite happy in his current position.' Now, there are four people interacting in a conversation system (i.e., Joe, Sue, Mary, and Julian), all trying to figure out what other people are thinking. Somebody needs to talk to Sue because somewhere in the system there is misunderstanding and potential dysfunctionality. This example illustrates the connection between conversation and mind management.

Projects become complex when mind- reading at high orders of intentionality is necessary to figure out 'what is going on', and can become unmanageable when inaccurate mind-reading propagates confusion.

Boulding (1956: 45) stated that 'the study of man is the study of talk' (Figure 4), which is significant as he refers to 'talk' rather than communication. All animals can communicate, but only humans can engage in meaningful conversation. I can communicate with my dog to coordinate her behaviour. My dog knows that she cannot get on my bed, but she does not know *why* because we cannot have a meaningful conversation about this. It sometimes seems as if my dog can read my mind, but she cannot as she has no theory of mind and is merely adept at observing and responding to my behaviour.

Tomasello (2006: 14) was interested in why chimpanzees have not developed language and argued that it is because they cannot form 'joint attention'. At about 12 months old, human babies respond naturally to the pointing gesture. If you point to something, such as a light, a 12-month-old will automatically look at the light. If you do this

often and say the word 'light' at the same time, one day the baby will likely point to the light and say his/her first word, 'light'. Parent and child manage each other's attention naturally via the pointing gesture, which is essential for early development of language. To the contrary, chimpanzees (in their natural habitat) do not point for each other, nor do they manage each other's attention, which is unsurprising considering they have no theory of mind. For Tomasello (2006), the interesting question is not so much why chimpanzees do not talk, but why do they not point for each other?

Having delved into Tomasello's (2006) statement outlined in Figure 4, I can derive some principles for human collaboration:

1. *Collaboration is uniquely human and should not be confused with coordination. Operating in first-order intentionality and interacting via communication merely coordinates behaviour.*
2. *Operating in second-order intentionality and interacting via meaningful conversation enables shared understanding.*
3. *In a nutshell, collaboration is shared commitment to shared goals.*
4. *Mind-reading impacts complexity and manageability. Shared commitment to shared goals is sabotaged when mind-reading is necessary, difficult, and inaccurate.*
5. *Meaningful conversation alleviates misunderstanding and reorganises people's minds, thus paving the way to manageability.*
6. *We facilitate learning by managing attention. Humans achieve joint attention instinctively and are born collaborators.*

I am using 'collaborative projects' in a very broad sense to refer to any situation where large or small groups of people need to make *shared commitments to shared goals.* This could refer to a family holiday, a small team trying to meet their targets, or an IT project improving productivity of a business unit, developing, and implementing an organisational strategy.

Manageability

As per Wittgenstein (cited in Raban, 1999: 151), the human experience is mediated by language, that 'the world we live in is the words we use' (Figure 4). He believed that there are specific vocabularies associated with various 'forms of life', which he calls 'language games', that must be meaningful to participate in a form of life (Wittgenstein, 1958). A sentence like 'a waltz has a three/four-time signature' will be meaningful to people who understand music, but will be meaningless to everyone else. Productive collaboration, and team performance, may require investment in a language game. A couple who wants to learn how to waltz will need to invest in the language game of music.

How can we collaborate if we do not understand each other's language? If a stranger talks to me in Mandarin, I will not understand a word they are saying, and the situation may become unmanageable. Yet, because we are human and have theory of mind, we are still able to manage each other's attention. Mind-reading is instinctive – the stranger may draw a train on a piece of paper, point to it, and shrug his shoulders, and I will then realise he needs directions to the train station. I can point out directions with my finger or improvise a map that points the way. In this way, we make the situation manageable via representation and gesture, especially pointing.

This example helps me to articulate a theory of manageability (Figure 4): striving for second-order intentionality to create and recreate a workably accurate understanding of each other's minds.

If I am thinking about what a stranger is thinking, then I am operating in second-order intentionality. If my mind-reading is accurate, then our minds are aligned. I do not know everything that is going on in the stranger's mind, but I know enough to make the current situation manageable – in other words, my mind-reading is workably accurate. Most importantly, the stranger's mind-reading is also workably accurate, so we have an intersection of minds that is tight enough to 'get things done'. A situation is manageable when everyone knows that everyone knows 'what is going on'.

Meaningful words, and language games, facilitate collaboration, but so do representations. In Figure 4, I extended Wittgenstein's philosophy to:

The world we live in is the representations we use.

Distributed cognition

When Hutchins (2000: xvi spoke about 'the environments' in which humans 'exercise their powers' (see Figure 4), he argued that human cognition is socially and culturally distributed, located not only within the skin of an individual, but also in a surrounding environment, rich in organising resources. Unlike other animals, humans can offload cognitive tasks onto the environment and then interact with this environment to organise their minds and increase their powers (Hutchins, 2000). For example, my mind was disorganised as I began writing this paper. I offloaded the mess in my mind onto the environment in the form of a cognitive map, letting one thought lead to another, enabling me to see my train of thought. Figure 5 shows how I clustered themes together using colour, thus organising my mind and helping me to structure this paper. I referred to this map constantly, giving me the power to write this paper.

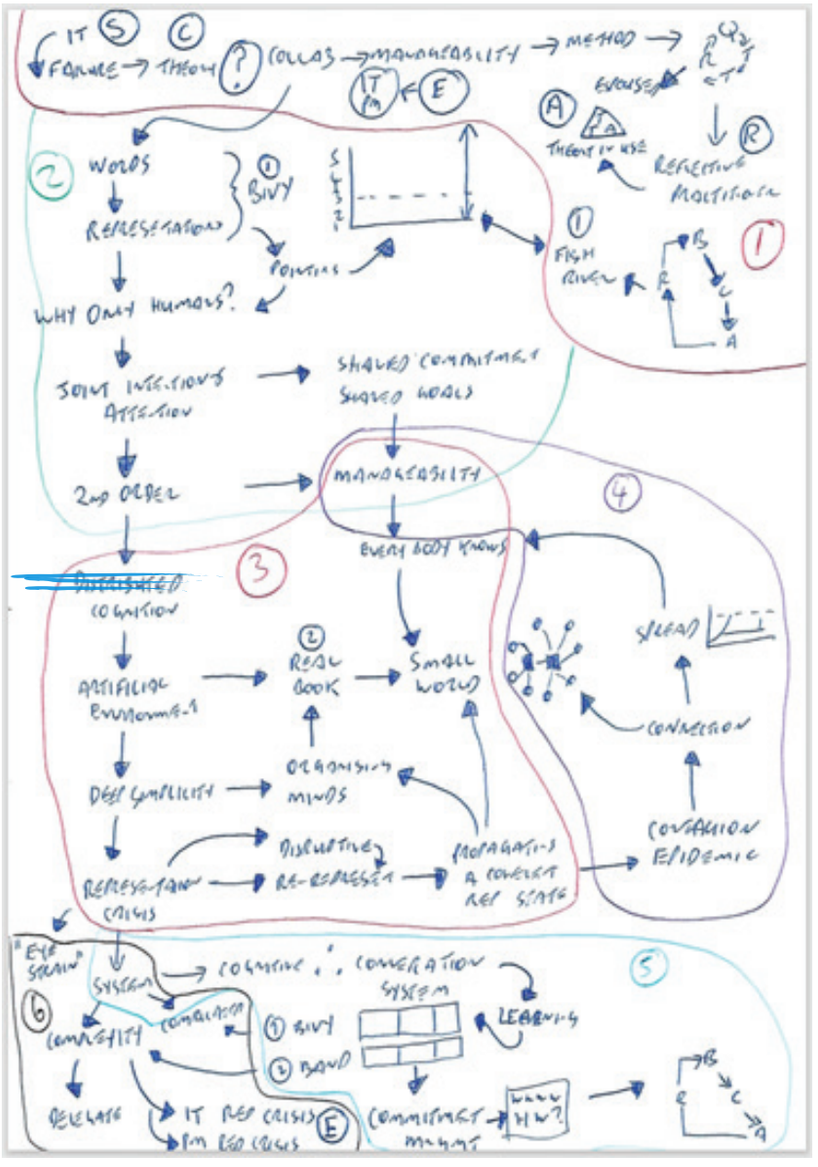


Figure 5: Cognitive map

Hutchins (2000) argued that human cognition is intrinsically social. When I offload my cognitive tasks onto the environment, not only does it help me organise *my* mind, but it may do the same for you. For instance, when I go on a hiking trip, I ease the cognitive load of remembering everything I need to pack in my backpack by referring to my backpacking list. People joining me on a hike have found my backpacking list useful to organise their own thoughts about hiking. If a system is a collection of parts that interact to function as a whole, we now have a distributed cognition system, where thoughts in people's minds (hikers) are structured by an environment that organises their thinking (the backpacking list). Cognition is socially distributed among people interacting within a shared cognitive environment.

If collaboration is shared commitment to shared goals, then our hiking trip is a collaborative project and the hiking group is a conversation system. The backpacking list not only organises cognition among the hiking group, but it also structures the conversations in which they make commitments to each other.

The success of the project will depend on the quality of the conversation. We make commitments when we talk. The way we think about something structures the way we talk about it.

Representation

Artefacts (objects such as my backpacking list) that we offload onto the cognitive environment must be meaningful to organise our minds and increase our powers. My backpacking list reminds me to pack my 'bivy bag'. This phrase may be meaningless to you, but there is a representation spectrum to choose from to clarify meaning (refer to Figure 6).

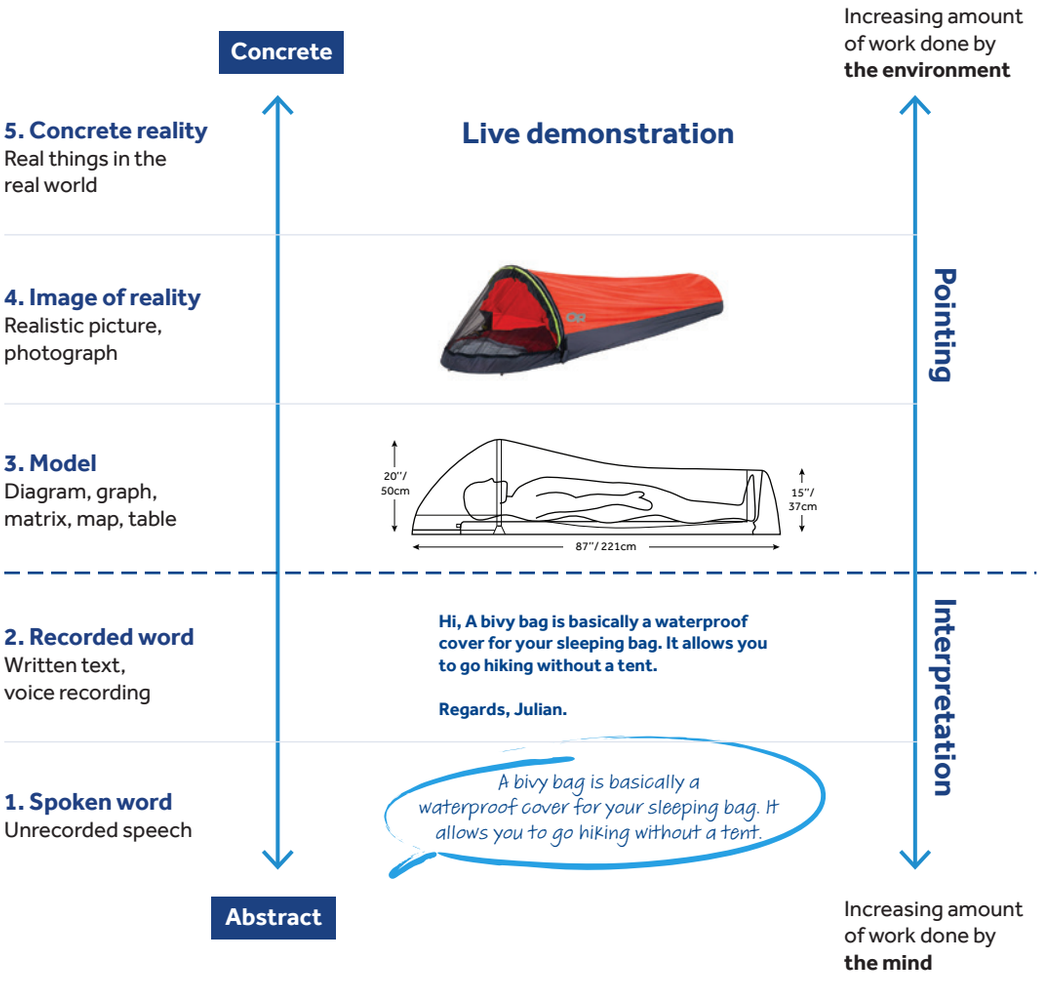


Figure 6: Representation spectrum
Source: Own draft

If my bivy bag is close by, I can give a live demonstration, otherwise I can tell the individual about it verbally. Moving from level 5 at the top of the spectrum to level 1 at the bottom of the spectrum is a movement from concrete reality to abstract words. When we are dealing with concrete reality, the environment does most of the cognitive work for us because we can see and touch the bivy, but spoken word requires interpretation to conjure up understanding. Level 2 (e.g., an email) allows rereading, relieving us of the cognitive burden of remembering the words. As we move up the spectrum over the dotted line to level 3, you see a diagram, a model of the bivy, which gives us something in the cognitive environment to point at to manage attention and facilitate learning. To facilitate means to make things *possible or easier*. Level 4 shows an image of reality, a photograph of a bivy. We might assume that the closer we get to concrete reality, the easier it is to make sense of things, but this is not always the case because reality is often confusing.

In complex situations, we need representations that make it possible or easier to learn in order to create manageability.

When concrete reality confuses us, creativity is required to design models representing deep simplicity sufficient to organise our minds. The level-3 diagram shows a model of a bivy in deep simplicity, indicating scale, which is probably the most important thing to understand, which is not immediately evident in the level-4 photograph. A bivy is claustrophobic and the diagram organises the mind clearly on this feature. When Hutchins (2000: xvi) claimed that the 'environments of human thinking are artificial through and through' (see Figure 4), this is what he is referring to. The diagram of the bivy is artificial, yet it organises our minds powerfully and facilitates rapid learning.

Coherent representation

According to Hutchins (2000: xvi) and as mentioned in Figure 4, performance is leveraged by the ability to 'propagate a representational state in the face of a series of disruptive events'. Learning how to play a song on the guitar requires coherence between a variety of representations on the representation spectrum (refer to Figure 7).

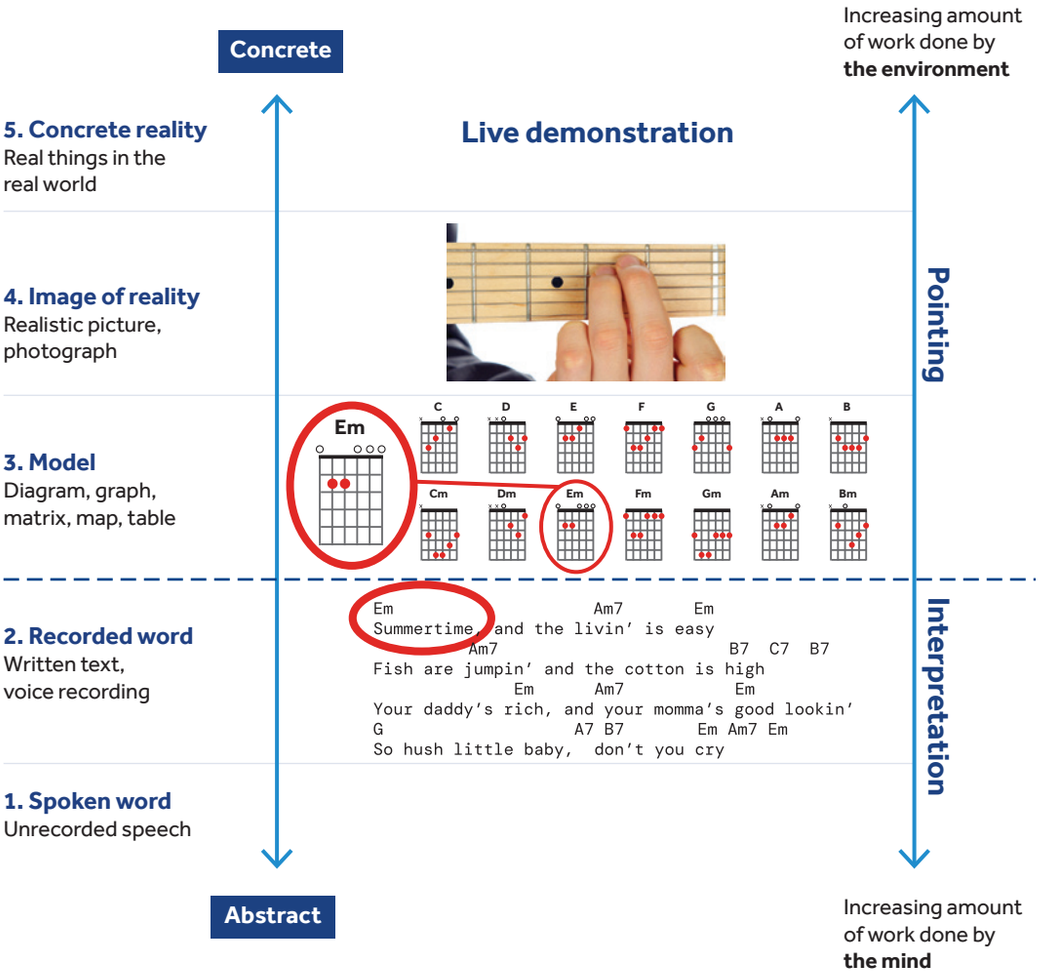


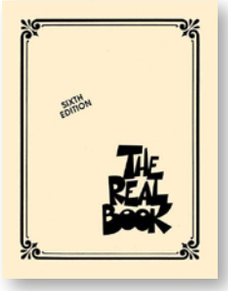
Figure 7: Propagating a coherent representational state
Source: Own design

Figure 7 shows how I learnt to play guitar. In the early days, I could not read music, but if I knew a tune in my head, I would be able to sing it, provided I remembered the words. Offloading words from our head onto the environment – that is, writing them down – constitutes a move from level 1 to level 2 on the representation spectrum. Figure 7 outlines the lyrics for 'Summertime', a well-known jazz standard. To play 'Summertime' on my guitar, I need to remember the chords. I have circled the first chord, E minor, represented as the symbol Em.

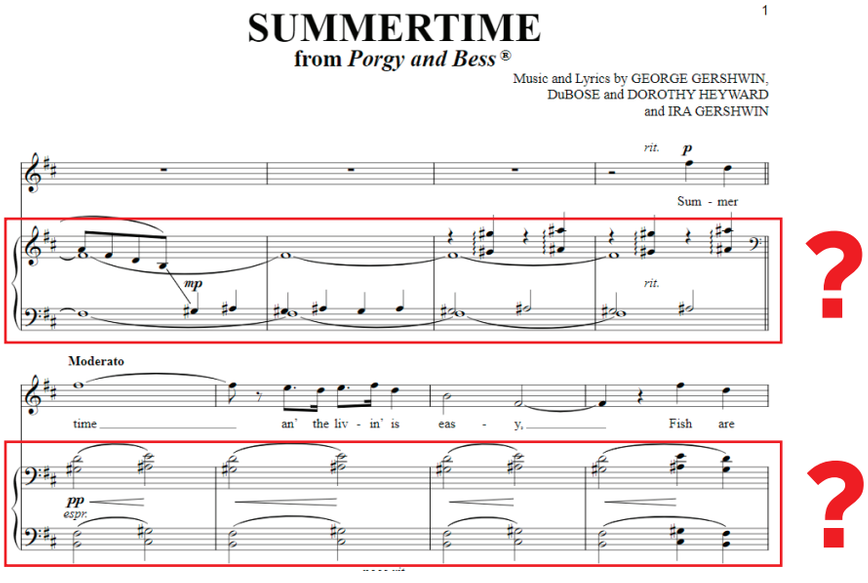
A chord chart is a common way of representing guitar chords and provides a level-3 model showing where to place your fingers on a guitar fretboard to play a particular chord. I learnt to play Em in this manner. Figure 7 shows what it looks like when somebody is playing Em on a guitar, a level-4 image of reality. If you were learning how to play guitar, you would be able to choose whether level 3 or 4 suits you best, but I find the deep simplicity of the chord chart organises my mind more efficiently than the photograph. I learnt to play many tunes this way because of coherence between the three modes of representation. The level-3 chord chart organises the mind, enabling seamless movement up and down the representation spectrum from abstract words and symbols through to concrete performance in reality.

Representation crisis

Collaborative projects can be plunged into unmanageability through a representation crisis. I experienced this in a jazz band where we used *The Real Book* to organise our musical collaboration (see Figure 8).[1] The ability to represent music in symbolic form is a stunning human achievement, but requires investment in time to learn how to read music. *The Real Book* enabled us to achieve a workably *accurate understanding of each other's minds*, sufficient for each person to play their part and perform as a group. All was well until our keyboard player left the band.



The Real Book for Keyboard and Guitar



Anna's Sheet Music

Figure 8: Representation crisis
Source: Own design

1 Since the 1970s, The Real Books have been the best-selling jazz books of all time, but were never formally published or distributed.

Anna, keen to join the band, was recommended by a local jazz club. We agreed to meet and I took *The Real Book* and my saxophone with me. Anna had been playing piano since she was a young girl and in recent years had become a jazz fanatic like myself. Everything seemed perfect until we started playing together. She was puzzled by *The Real Book* because she could not 'see the chords'. I had no idea what she was talking about. At the jazz school that I attended, *The Real Book* was universally used by everyone and was the essential book you needed to play in any band at the school. How did Anna's sheet music differ from the lead sheets in *The Real Book*? Figure 8 shows her question.

Anna showed me her sheet music for 'Summertime' – for every line of music in *The Real Book*, she had two additional lines, enabling her presumably to 'see the chords'. Anna was classically trained and could read music extremely well, and I began to realise she had learnt music in a completely different way to our original keyboard player. I realised he must have learnt to play the keyboard the same way I learnt to play the guitar. The first chord in this version of 'Summertime' is Am7. Our original keyboard player must have learnt the chord fingering directly on the keyboard, whereas Anna needed to see all the notes written out in order to play it.

We now had a representation crisis. Our lead sheets would not be sufficient for Anna and our band to achieve *a workably accurate understanding of each other's minds*. Bands are complex and difficult to manage at the best of times, but become impractical and unmanageable when people cannot read music. I was sure that Anna was the right person for our band, so we needed to resolve the representation crisis. Figure 9 shows how we managed *to propagate a coherent representational state in the face of a disruptive event.*

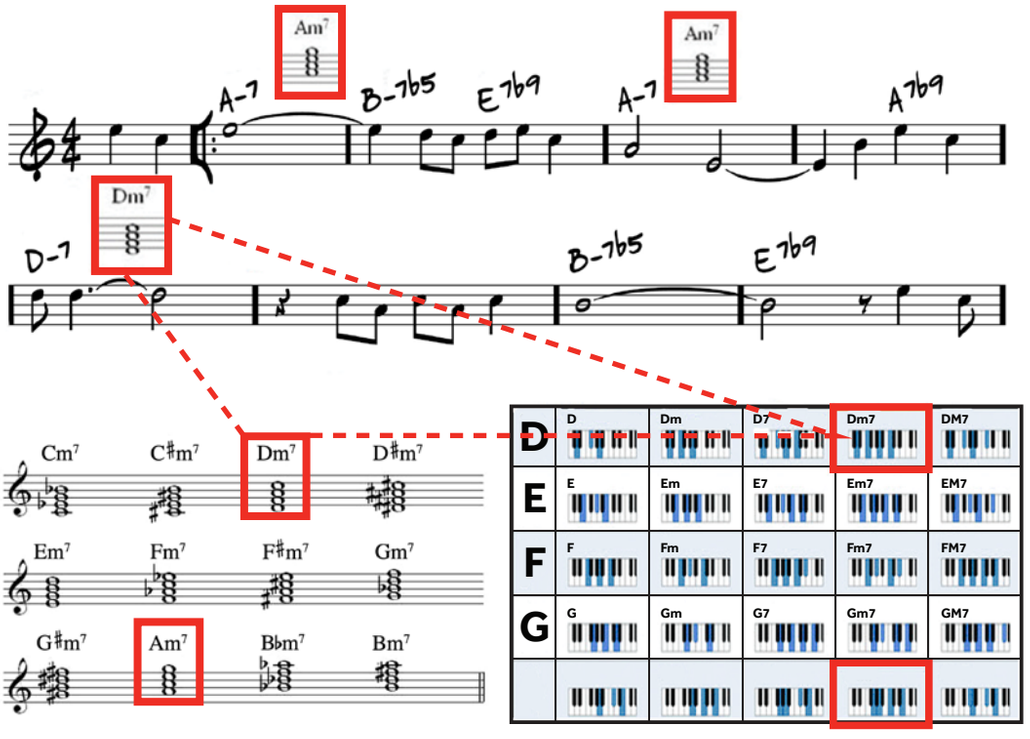


Figure 9: Resolving a representation crisis
Source: Own design

I wondered if there were chord charts for piano that performed a similar function to chord charts for guitar, as represented in Figure 7. Sure enough, we found two useful modes of representation. The chord chart (see the bottom left chart in Figure 9) shows, for example, the four notes that make up the chord Dm7. The piano chord chart (refer to the bottom right chart in Figure 9) shows the corresponding fingering for each chord on a keyboard.

Therefore, Anna can see how the notes of Dm7 from the chord chart translate to Dm7 fingering on the keyboard. Whenever Anna sees the symbol Dm7 on a lead sheet, she can write out the notes next to it in the same format as the chord chart. She will then be able to 'see the chords' as she plays. Figure 9 shows her beginning to represent chords on the lead sheet for 'Summertime', including the chords for Dm7 and Am7.

Our band became manageable because we resolved the representation crisis. Nevertheless, it did require additional investment in time to *continually propagate a coherent representational state.* Instead of simply arriving at practice sessions and playing randomly from *The Real Book*, we had to agree and commit to what we were going to play before we arrived, and Anna had to commit to re-representing her lead sheets ready for the next practice session. As per the manager's action learning model (see Figure 3), having made the situation manageable, we still needed to manage it by *committing to action*, remembering that however excited we are about decisions, they do not miraculously implement themselves.

Conversation systems

If, as Boulding (1956: 45) stated, 'the study of man is the study of talk' (refer to Figure 4), then we need a notation to study conversation systems so we can make the 'tenuous web of conversations' more manageable. If a system is a collection of parts that interact to function as a whole, then it is not difficult to conceptualise a band as a conversation system. Band members (i.e., the parts) interact via conversation to perform jazz. More difficult to conceptualise, a paradigm shift is to conceptualise various conversations as parts of a conversation system interacting via their cognitive environment. Figure 10 represents ongoing management of a band as four interconnected conversations – the first column shows *who is talking* and the third column shows *what they are talking about*.

Who will talk?	What will we take into the conversation?	What will we talk about?	What will we take from the conversation?
Julian Frik Anna Piet	**1a. Repertoire file** **1b. Practice file** 1c. Real book 1d. Photocopier 1e. Diaries	1. What new music do we want in our repertoire? **Commit to:** new numbers we want to practice	**1b. Practice file (+ new numbers)** 1e. Diarised practice session + to-do list
Julian Frik Anna Piet	**1a. Repertoire file** **1b. Practice file**	2. What numbers are we happy to perform in public? **Commit to:** numbers that are now ready	**1a. Repertoire file (+ now ready numbers)** **2a. Demo tape**
Julian Gig host	**1a. Repertoire file** **2a. Demo tape**	3. Do you want us to play a gig? **Commit to:** agreed gig requirements	3a. Gig details
Julian Frik Anna Piet	**1a. Repertoire file** 3a. Gig details	4. What numbers will we play at our next gig? **Commit to:** sets, play sequence, logistics	**4a. Gig file** 4b. Gig logistics + to-do list

Figure 10: Conversation system
Source: Own design

There are many different ways to talk in a situation – some more productive than others. Conversations become productive when people learn quickly and commit to specific outcomes, so it makes sense to design them deliberately as learning conversations. Each conversation asks participants to commit to a specific answer to the conversation question.

Thus, every conversation begins with a question and ends with a commitment. The band has recurring conversations about:

1. What music do we want to play?
2. What music are we ready to perform in public?
3. Does anyone want to hear us play?
4. What music will we play at our next gig?

The second column in Figure 10 shows the cognitive environment that structures the conversation. This represents Hutchins's (2000) *artificial environment that gives people their powers.* Only tangible artefacts that are *taken into the conversation* and are physically present during the conversation are included in this column. Thoughts in my head that are verbalised during the conversation but never offloaded – in other words, level 1 on the representation spectrum – will *never* appear in the second column. Recorded thoughts, models, images of reality, and physical artefacts – that is, level 2 through level 5 on the representation spectrum – can appear in the second column. These artefacts should be carefully designed to organise intelligent thinking, thus structuring meaningful conversation and facilitating commitment. Similar to the second column, the fourth column represents any artefact produced by the conversation or amended during the conversation.

A verbal commitment that remains inside people's heads as they leave the conversation and is never offloaded into the cognitive environment will not be represented in the take from the conversation column.

In Figure 10, I have colour-coded various artefacts in the cognitive environment to make it easier to understand how conversations interconnect and interact with each other. In conversation 1, the repertoire file (blue) enters the conversation system. You can see that it is used to structure all four conversations, that it is updated in conversation 2, the conversation where the band agrees that a number is now ready to be performed in public and can move from the practice file (red) to the repertoire file. The repertoire file is labelled '1a' because it made its first appearance in conversation 1 and it keeps this label throughout. This means that you can always trace any artefact back to the conversation where it first appeared in the conversation system.

A good way to make sense of the conversation system is to view it as a movie script:

- Imagine the band in **conversation 1** looking through *The Real Book* for new numbers that they want to play, looking at their current repertoire file for gaps in their repertoire, and photocopying and filing lead sheets of numbers they want to practise in the next session in the practice file. Having diarised the next session and noted anything else they need to do, they practise their parts individually in preparation for the next practice session.
- Imagine **conversation 2**, where the band members record themselves while trying to get new numbers to a level where they are ready for public performance. If they are happy with what they hear, they move the lead sheets from the practice file (red) to the repertoire file (blue), and the recording becomes a demo for other people to listen to.
- Imagine **conversation 3**, where Julian is talking to potential hosts, sharing the repertoire and allowing potential hosts to listen to demo tapes to help them decide whether to hire the band. Rather than remembering details of the gig, they are written down.
- Finally, imagine **conversation 4**, where the band creates a gig file (purple) by temporarily moving lead sheets from the repertoire file and sequencing them in order of play so that everyone is 'on the same page' during the performance.

The conversation system represented in Figure 10 shows *deliberate design* of the cognitive environment surrounding each conversation, that artefacts created or changed in one conversation become the artificial environment that organises thinking in subsequent conversations.

If group performance is about propagating a coherent representational state, then the collaboration must be designed deliberately.

Small world networks

To understand Strogatz's (2003: 251) claim that 'anything that can spread will spread more easily and quickly in a small world', (see Figure 4), we need to understand the architecture of small world networks. Figure 11 contains two networks with black dots representing nodes and lines, which show how nodes are connected in a network. There are numerous types of networks, but for our purposes, the nodes represent people, more specifically the minds of people. Both networks have identical nodes, but they are connected differently resulting in different architectures.

A regular network looks like a fishing net, each node making a few connections to other nodes. The small world network has a different architecture dominated by three highly connected hubs (coloured red). A wide variety of networks self-organise into small worlds on a rich-get-richer basis because of the benefits of connecting in a hub (Buchanan, 2002: 87). Airline routes, for example, form small worlds because of the attraction for a small airport to connect to a major international airport, thus becoming connected to the whole world (Buchanan, 2002: 129).

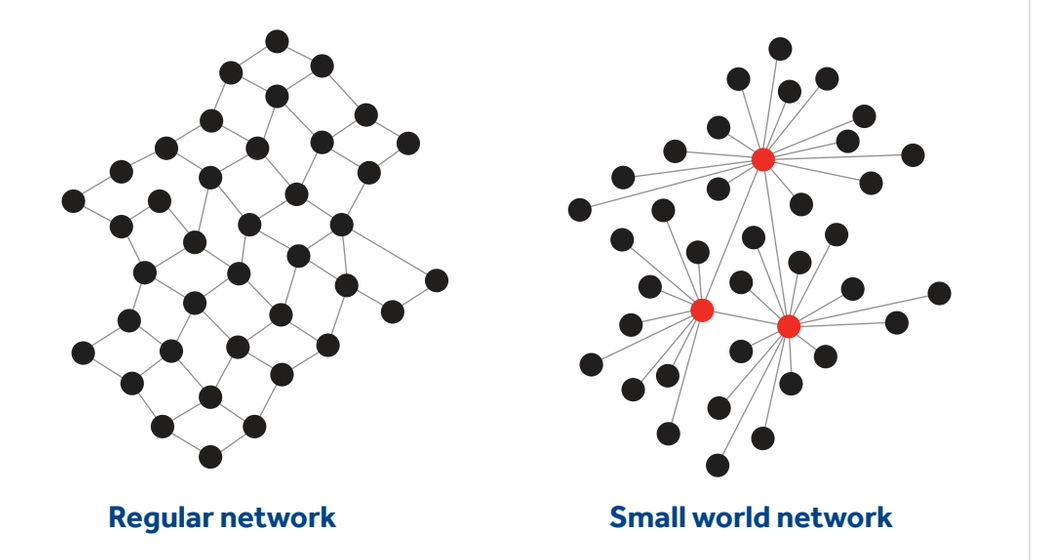


Figure 11: Small world network
Source: Own design

Epidemics struggle to spread in a regular network because each node can only infect a few other nodes, so they tend to fizzle out. Epidemics are almost inevitable in a small world when highly connected hubs become infected. Hubs are superspreaders. Metaphorically, we want contagious, superspreader manageability where a *workably accurate understanding of each other's minds* rips through the network like wildfire.

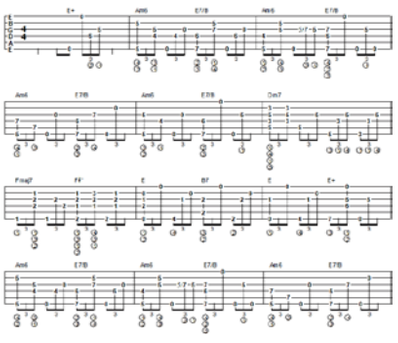
The world of music is vast and contains many forms of life. There are several different types of music and many musicians with diverse language games, as we saw when classically trained Anna joined our jazz band. 'Summertime' can be played in various keys and represented in numerous ways, such as guitar and harmonica tabs (refer to Figure 12). To compound things, when I play the note C on a tenor saxophone, the note that is heard is a B-flat, and C on an alto saxophone sounds like an E-flat. Our jazz band needed three different versions of The Real Book to play in harmony.

When I describe the world of music in this way, I am describing a regular network (see Figure 11). Many musicians in this network do not share a *workably accurate understanding of each other's minds*, which makes it difficult to connect. I can have meaningful conversations with a few amateur guitarists at the local folk club, but I cannot perform with them because I cannot read their music. Consequently, attempts to collaborate soon fizzle out.

Figure 12 shows how the jazz school I attended created a small world and was successful in creating a w*orkably accurate understanding of each other's minds.* *The Real Book* is a vast compendium of jazz standards, represented as lead sheets, perfectly synchronised for instruments usually needed in jazz. Obviously, people have different levels of proficiency, so bands perform at different levels, but eventually individuals reach a level where they can sight-read and play almost anything immediately.

If a mind is represented as a node, then something offloaded from a mind into the cognitive environment can also be represented as a node. An appealing new song that jazz musicians have in their heads is unlikely to become contagious, but a song offloaded into all three *Real Books* will infect the whole jazz school like an epidemic. *The Real Books* are superspreader hubs in a small world network (see Figure 12). Tenor saxophone, alto saxophone, and keyboard players connect easily and quickly because their Real Books are harmonised, thus interconnected as a backbone capable of propagating a coherent representational state for every node in the network.

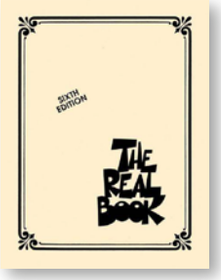
The conversation system represented in Figure 10 makes an important distinction between *who will talk* (column 1) and *what they will take into the conversation* (column 2). I believe that however intelligent and knowledgeable people may be, their minds alone are unlikely to become a hub in a small world network. Column 1, in effect, represents level 1 in the representation spectrum. It is difficult to see inside somebody's head, it takes time to listen and interpret what they say, and it is easy to forget or misinterpret their words. Column 2 asks for the deliberate design of the cognitive environment to accelerate *a workably accurate understanding of each other's minds.* Ideally, the cognitive environment (columns 2 and 4) is deliberately designed as a small world to create contagious manageability.



Summertime guitar tabs

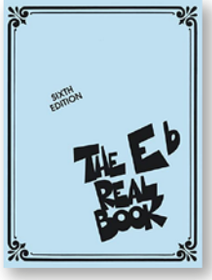
```
 8  7  8   -8   7  -8  8  7  -6 5
Summertime and the living is easy
 8    8  8 -8 -8
Fish are a-jumpin'
7   -6   7 -6   7  -7
And the cotton is high
 8    8  7    8   -8
Your daddy's rich and
  7   -8 8    7   -6  5
Your mama's good looking
5    6     5  6  -6 7  8-8   7 7 7-6
So, hush, little baby, don't you cry
```

Summertime harmonica tabs



Keyboard, guitar, bass, harmonica

Tenor saxophone, soprano saxophone, clarinet



Alto saxophone

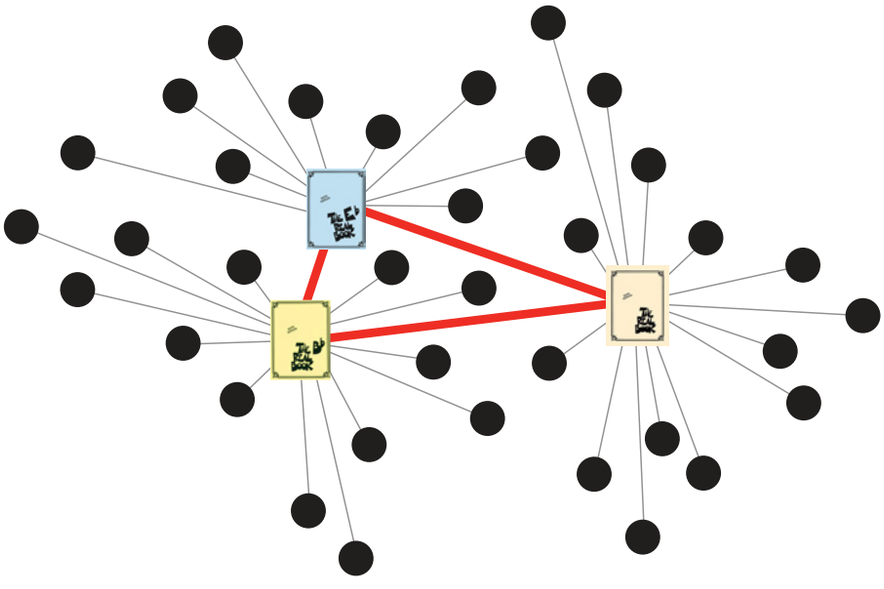


Figure 12: Small world collaboration network
Source: Own design

Paradigm shift

Because there is nothing so practical as a good theory, I am able to use my theory of collaborative projects to inform and develop various methodologies, but these methodologies are outside the scope of this paper (Day, 2019). Instead, it is interesting to see whether the theory alone is practical and useful in its own right.

If projects are the engine rooms of our organisations, can we use the theory of collaborative projects to diagnose why there is persistent project failure so that we know how to improve organisational effectiveness?

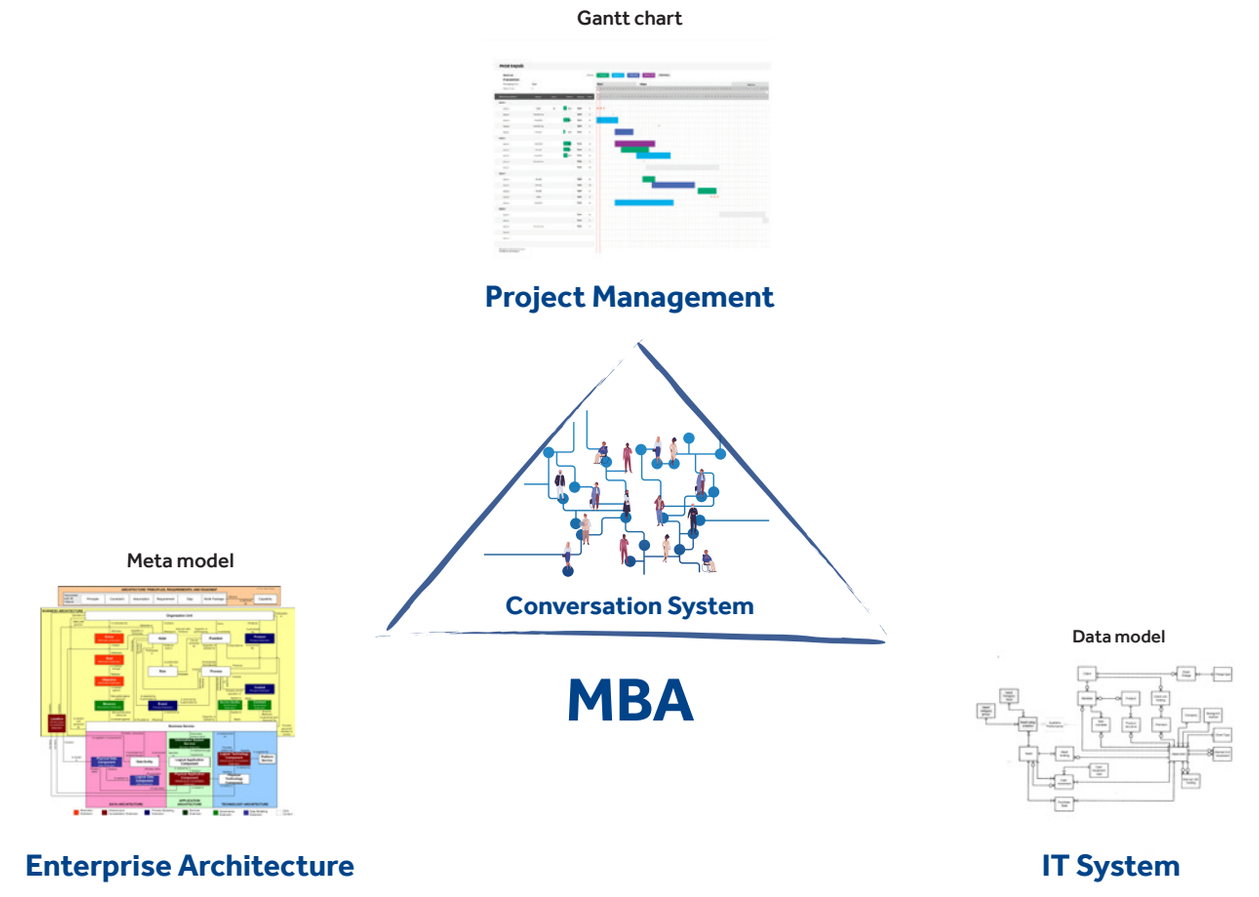


Figure 13: An organisational project
Source: Own design

Figure 13 shows a typical organisational project that begins with strategy and ends with business rules programmed in an IT system. Typically, this would be viewed as a process, but the organisation is represented as a conversation system. This is a major paradigm shift and changes the language game. The paradigm shift is represented in the action learning model where *commitment drives* action (Figure 3), emphasising that we make shared commitments to shared goals in human conversation.

The dominant language game of mainstream project management is action planning, whereas the language game of collaborative projects is conversation design.

Imagine that all stakeholders in Figure 13 are fully accredited professionals in their respective fields, including executives who might hold MBAs. On the surface, it looks as if the organisation is well equipped to make a success of its project. Practical theory should prompt useful questions.

A basic question is whether everyone understands the difference between complicated and complex? Complicated situations are puzzles with right answers that can be established with knowledge and logic. Complex situations are problems with no right answers that can be resolved by reaching an agreement via collaborative conversation. Agreeing to a strategy to add customer value is complex, whereas programming a settlement discount rule into an IT system is complicated but completely manageable by IT. Complicated situations need clever solution providers, while complex situations need wise facilitators. Do the certified professionals in Figure 13 understand the role of facilitation in complex situations? Even though intelligent people get together to talk, there is no guarantee that they will have an intelligent conversation. Is there anyone in the organisation skilled in conversation design and facilitation?

IT specialists are competent in the complicated aspects of systems implementation, but struggle with the complexity. Delegating complexity to IT is high risk. Do executive decision-makers in an organisation fully understand this risk and how to manage it?

If we observe dysfunctionality, then we suspect a representation crisis. For strategy to be viable, it must be integrated into systems architecture. This involves conversation between executives and enterprise architects who are responsible for the evolution and integration of the entire systems platform supporting the whole business process. Their abstract metamodels are a private language game of mesmerising complexity that a senior executive once described as 'an eye-strain document', a similar reaction that I had to Anna's sheet music. If executives and enterprise architects cannot have an intelligent conversation, then the project in Figure 13 has got off to a rocky start.

Gantt charts epitomise project management, but do they suffer from a representation crisis? These charts are excellent for representing the sequence in which activity should be done – the critical path – to achieve milestones. They work well for complicated projects like construction and engineering, but lose traction in complex projects where the main challenge is agreeing 'what we want', rather than 'how to get things done'. In many projects, activity sequencing is not the main challenge, for example, managing a band.

If Gantt charts are a hammer, there is danger in treating every project as if it were a nail.

The paradigm shift from project as action planning to conversation facilitation exposes my main reservation about Gantt charts. If my job is to turn around a failing project, I want to know the status of commitments that drive action. Who intended to act? Who made a commitment to act? Have these commitments been honoured? The Gantt chart shows the plan, not the commitments that make plans come true. We should not confuse planning with management.

The foundation of most IT systems is a relational database that stores data. To design these databases, IT systems analysts need to talk to business people about their data architecture. I know from bitter experience that data models used by IT are practically incomprehensible not only to businesspeople, but to many IT professionals as well. Eventually, I found some creative, non-standard ways to resolve this representation crisis, but this requires significant investment in time and effort. At this stage, we can see that the project represented in Figure 13 is likely to be dysfunctional and unmanageable.

Organisational effectiveness

This raises important questions for executives responsible for organisational effectiveness:

- If projects are the engine room of our organisations, how do we resolve these representation crises?
- If organisational projects persistently fail, should executives learn the relevant language games?
- If I want to perform in a band, I have to invest considerable time in the language game of music. In the same way that executives learn the language game of strategy, marketing, finance, operations etc. on their MBA, do they need to invest in the language game of enterprise architecture, project facilitation, and data modelling? We have now experienced at least four decades of persistent IT project failure, so perhaps there is no longer a choice.

This suggestion may seem overwhelming and impractical. Consequently, the next question is whether we can creatively re-represent these representations in deep simplicity so that people can reconnect and create contagious small world manageability? Anna's sheet music was 'an eye-strain document' that was elegantly re-represented in lead sheets, so there was no need for our band to learn classical music. If professionals spent time thinking about the cognitive environment of conversations they need to design and facilitate, could they accelerate a workably accurate understanding of each other's minds?

Perhaps the most basic question of all is whether the three disciplines highlighted in Figure 13 are founded on solid theory? We know that mainstream project management is not.

If a methodology claims that it, for example, has seven key principles, are these really principles in the true sense of the word, or merely method in disguise? Will people who know how, really understand why, especially when negotiating an unforeseen, disruptive event?

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Deliberate collaboration

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