Chapter 6 - Thinking systemically to mobilise IPD capability

Authors, Bronte van der Hoorn, Jonathan Whitty, and Derek Walker

Introduction

Setting-up an organisation to successfully participate in integrated project delivery (IPD) can be a daunting task. In this chapter we introduce the SyLLK model as a tool that can assist an organisation in identifying what is required to mobilise integrated project delivery capability. SyLLK is an abbreviation for **Sy**stemic **L**essons **L**earned **K**nowledge. The model has been developed to assist organisations in viewing and evolving their capabilities (sometimes from lessons learned) in a systemic manner.

We commence the chapter by examining key concepts in systems and systems thinking. This is followed by an introduction of the continental perspective of project work. These foundations then enable us to introduce the SyLLK model and how it can be useful in IPD. To assist us in shifting how we think about organisational capability, such as IPD, we introduce some new terms. We describe an organisation as a series of in-order-tos that are together an equipmental totality. All of these in-order-tos are the fusion of six organisational systems (learning, culture, social, technology, process and infrastructure). For each of these in-order-tos to function properly, and therefore the equipmental totality to have its desired capabilities, the six organisational systems need to have the required facilitators enabled to make that in-order-to work. If there is an absence or failure of a required facilitator in any of these systems the in-order-to will be hindered.

In summary, we will demonstrate how the SyLLK model highlights that capability is realised through the coupling of many features across various organisational systems. Simply expecting that setting-up BIM software or hiring staff who have undertaken IPD or professing that we value collaboration will not be enough to succeed in IPD. Organisation's need to take a systemic view to understand IPD capability, and the SyLLK model is a tool to assist with this approach.

In taking a knowledge and organisational learning perspective we present a complimentary perspective to Chapter 18 which has a focus on innovation diffusion within IPD projects. Readers may also be interested in Chapter 10 which explores the role of culture in enabling IPD teams to collaborate. Additionally, Chapter 13 that discusses trust and commitment has relevance to the interaction of people in understanding of systems that may be of interest to this chapter's readers.

Key terms in systems and systems thinking

Before we introduce the SyLLK model and how it can assist us in understanding what is required to integrated project delivery, it is important to clarify key terms commonly associated with systems.

System

The word system comes from the Greek term 'sunistanai' which means "to cause to stand together" (Senge, 2011). As such, we can define a system as a whole with parts that interact over time with a joint purpose (Proctor, 2008; Senge, 2011). Our world is full of systems. Examples include: our human bodies, organisations, cars, computers, our political systems, and the weather. In any of these examples, we can break the system into parts, but we acknowledge that these parts are interacting for some purpose. A fundamental characteristic of all systems (simple, complicated, and complex) is the interrelatedness of their parts.

Systematic

Our next term is ‘systematic’. Systematic has a different meaning to systemic which we explore below. When we refer to something as systematic, we are characterising it as being methodical, following a plan or sequence, or being ordered (Oxford English Dictionary, 2017). Being systematic infers that we are breaking down a task into orderly parts.

We can be systematic in the way we undertake a particular task. For example, we may prepare a meal in a systematic way, according to a recipe, which will result in all the necessary components of the meal being ready at the appropriate time. We may be systematic in holding a meeting, moving through each agenda item one after another, in an order that makes sense given the meeting objectives. If we identify problems in an organisation or project and set-out a plan to resolve this problem, we may work through this plan in a systematic (orderly) manner.

We would argue that systematic thinking is pervasive throughout the dominant project management bodies of knowledge. The mechanistic and concrete language in the Project Management Body of Knowledge (2013) has be described as systematic (Jugdev, 2012). Such lifecycles and models infer that there is a predictable, pre-planned order of how things should unfold. When we are preparing a project schedule, we are generally systematic in breaking down the work to be done, ordering the tasks in terms of their precedents and then assigning duration estimates. This systematic approach to planning work is not necessarily a problem. However, it is a problem if we believe that projects will unfold in a predictable systematic way, and that this systematic efficiency is all that is required to achieve a project’s deliverables.

Systemic

Systemic is the permeating of something throughout an entire object, phenomena or experience. If something is systemic it is pervasive throughout a system. We talk about a virus being systemic in our bodies, or systemic corruption or racism in an institution or society. When we discuss systemic corruption we are referring to the corruption being found throughout all aspects of the system. This may include for example particular values that are held and reinforced by the people in the system, protocols and norms in how they interact, and technology systems and physical spaces which allow for the corruption to occur.

A systemic view considers an object, phenomena or experience holistically. In the case of project work, we can conceptualise the experience as being the interaction of many different systems. And in the case of IPD, we can consider many different organisations with the common purpose of achieving set project deliverables. When we use a systemic view we recognise that each and every element in the projects’ systems (i.e. all the various systems of all the organisations involved in the project work) has the potential to either facilitate progress or be a barrier to progress. As such, adopting a systemic approach calls us to critically examine whether we have ‘wired up’ all the involved systems to facilitate, or not, the achievement of our project objectives. When we discuss the SyLLK model, we will provide a particular method for applying a systemic view to project work.

Simple Systems, Complicated Systems, Complex Systems and Complex Adaptive Systems

In recent years there has been growing interest in ‘complex’ project management (Whitty and Maylor, 2009). This is not surprising given that the creation of a distinction between complex and ‘not’ complex projects stratify project managers and awards prestige to ‘complex’ project managers (Whitty, 2008). However, given that it is established that humans are complex adaptive systems, and furthermore there is wide agreement that organisations are complex adaptive systems (Holland, 1995; Keshavarz *et al.*, 2010), and that project work is undertaken by humans that organise themselves (organisations), it is flawed to suggest that any project work could be simple or indeed complicated. Rather, it is more accurate to suggest that some project work harbours more complexity than others.

We will digress briefly to distinguish between simple, complicated and complex. If a system is simple, it is relatively easy to predict its behaviour and a relatively small amount of information is required to described the system (McCarthy *et al.*, 2000). The operation of an analogue clock or water taps in a kitchen could be considered ‘simple’. A more complicated system can still be described and its behaviour predicted, but it will have more parts (Rickles *et al.*, 2007) and it would require considerably more information to describe its behaviour. A car engine or computer could be classified as complicated. However, with complex behaviour it is incredibly hard to accurately predict how the phenomena or experience will unfold or behave as there are emergent properties associated with the parts of the system which cannot just be ‘added up’. As such, it is very difficult to describe the behaviour of a complex system (Bar-Yam, 1997; McCarthy *et al.*, 2000). The weather is an example of a complex system, which can be simulated and modelled. However, knowing exactly what the real weather will do next is incredibly hard, and its behaviour is often is described in a range of probabilities. And the longer the range of the forecasting, the more inaccurate the predictions become.

We highlight here that simple and complicated are on a spectrum because they share the common characteristic of predictability (refer Figure 6.1: part (a)). The rules that determine the behaviour of simple and complicated systems are governed by how the component parts of the system interact, often systematically, with each other. The nature of these interactions can be foreseen at the outset, and therefore the behaviour of the system can be predicted and mapped back to the foreseeable and knowable interactions of the parts, as with a jet engine. If we make a change to a part, we can reliably predict, using our knowledge of engineering rules, how this change will impact on the behaviour.

Complex should not be considered an extension of complicated, as the behaviour of complex systems can only be forecast based on a probability. Its behaviour cannot be predicted with any certainty. The rules that determine the behaviour of a complex system emerge out of the relationships of the parts. The nature of these relationships are incredibly hard if not impossible to foresee at the outset. The rules for a complex system’s behaviour are therefore determined by the conditions of the system (the relationship of the parts) at any moment in time. Any change in the relationship between the parts can have unforeseen effects.

Within the concept of complex systems there is a spectrum of greater or lesser complexity which is commensurate with the extent of emergent behaviour (refer Figure 6.1: part (b)).

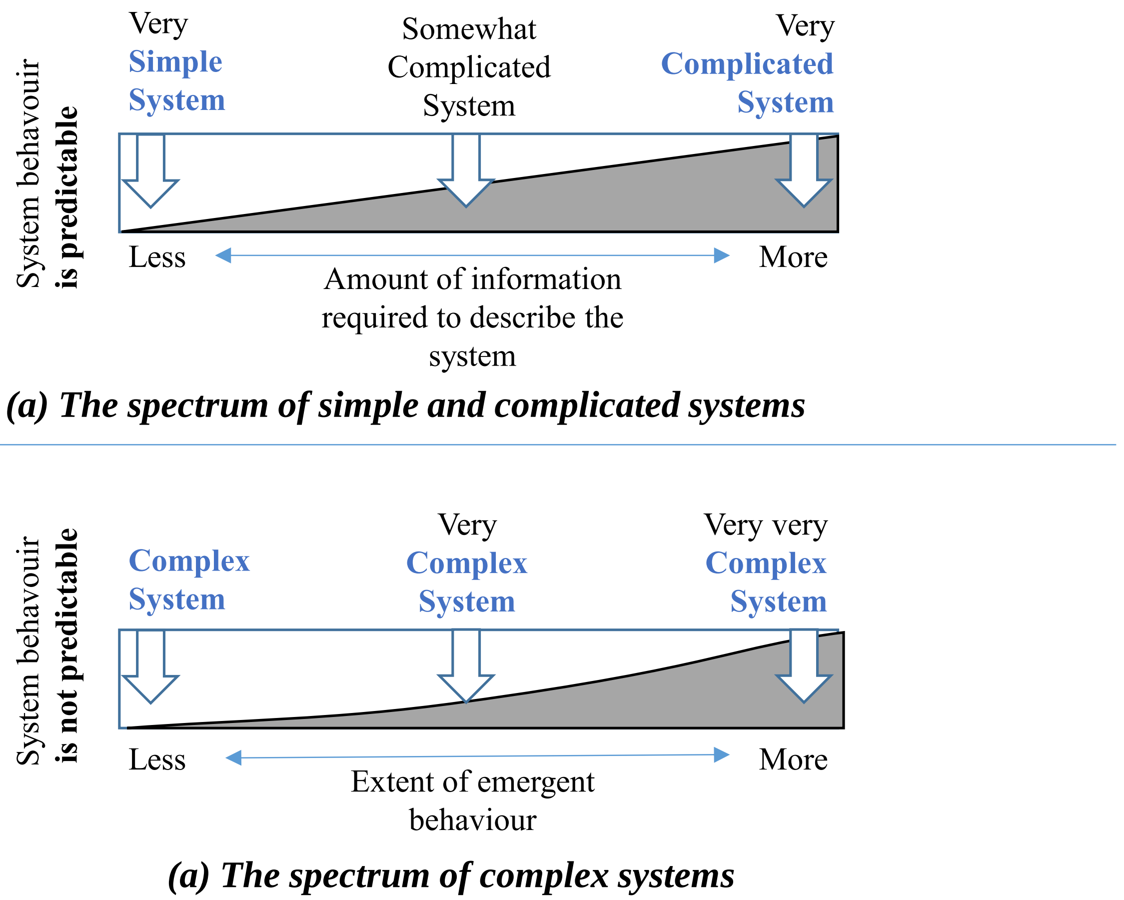

Figure 6.1 - The two system spectrums

A complex adaptive system is a special case of a complex system. Complex systems such as the weather do not have a structure that enables them to adapt to their environment. However, complex adaptive systems like human civilisation, stock markets, social insect and ant colonies, the human body and human brain, do have structures that enable them adapt and therefore modify their behaviour to their changing environment (Bak, 1997; Bar-Yam, 1997). From an evolutionary point of view, the structures and features of complex adaptive systems have been shaped by the various processes of selection, and their features and traits (their adaptations and behaviours) have been fashioned by their environment and inherited from their predecessors (Kauffman, 1993).

The implication of this exploration of the various types of systems is that we can clearly identify that all projects are a form of complex adaptive system as their environment and actors (human beings) are themselves complex adaptive systems. The only distinction we can make is that some projects are more complex (i.e. less predictable and more difficult to describe the behaviours) than others.

Complex Adaptive Systems

Given that we have established all project work is the product of a complex adaptive system we can explore this system type in greater depth. There are two complex adaptive system characteristics that are most pertinent for our discussion of the SyLLK model. Firstly, complex adaptive systems manifest behaviour which is emergent. That is to say that the behaviour of a complex adaptive system cannot be simply inferred from aggregating the behaviour of its components (Bar-Yam, 1997). Rather, the behaviour of the system is in *how* the elements of the system are coupled at any instant in time, which results in the emergent rules that drive the behaviour (Holland, 1992). In terms of our examination of projects this means that for project work to exhibit a behaviour (e.g. achieve a particular deliverable) we need to take into account that no single element involved will enable achievement of the behaviour. Furthermore, we need to pay attention to how all the elements of the system are coupled together as this will determine the overall behaviour experienced. A related concept to what we are saying here is that there is no central point of control in a complex adaptive system (Holland, 1995; Keshavarz *et al.*, 2010). Control, or the behaviour of the system, is distributed across the elements of the system (Holland, 1995; Keshavarz *et al.*, 2010). In simple terms, we can say that the capability (the required behaviour) to deliver project work is distributed across the various elements of the organisation or organisations. And it is critical that we pay attention to how these elements of the organisation (or organisational systems) interact with each other.

The second feature of complex adaptive systems that is pertinent to the SyLLK model is evolution. As introduced above the structures of complex adaptive systems are shaped by their environment (Stacey, 2007). To be specific, in a complex adaptive system, over time, the structures and behaviours evolve (change) in a manner that can benefits its survival in its environment (Smit *et al.*, 1999; Edelman *et al.*, 2009). It has been acknowledged that the structure of organisations also adapt to the pressures of their environments (Dosi and Marengo, 2007). The environment in this context also includes the cultural environment in which people think and act. We leave our discussion here on those aspects as the culture of IPD projects is more fully explored and discussed in Chapter 10 and implications of trust and commitment on the intentions and actions of people is also further discussed in Chapter 13.

Organisations involved in IPD may or may not have structures that enable them to behave in a manner conducive to IPD. If an organisation is involved in IPD but their organisational systems have not changed in a way commensurate with IPD, then it will need to change its structures to create favourable alternative behaviours. However, this changing (or adapting) must be systemic and the broader environment supportive of the changes. If this not the case, the organisational systems will continue to exert their influence and create behaviours that will ultimately threaten its survival in the IPD environment and even the success of the project work.

To summarise our clarification of these key terms: all project work occurs as a result of the behaviour of a complex adaptive system. In fact, we could consider project work occurs as a result of mega complex adaptive system that comprises many other complex adaptive systems that are inextricably coupled. With this knowledge, we know that the experience of project work will be dependent on the emergent behaviour of many interacting elements of many systems. Simply, that project work has a systemic nature where progress or issues are generally attributable to multiple elements and how they are interacting (rather than a single element). Furthermore, this complex adaptive system which is attempting to deliver the project work has evolved and will evolve due to various pressures in the environment.

A continental perspective of project work

Looking for new ways of thinking about project management

There continues to be ongoing dissatisfaction with the prominence of project failures and the offerings of the project management literature (Cicmil and Hodgson, 2006; Thomas, 2006; Winter *et al.*, 2006; PM Solutions Research, 2011; Bloch *et al.*, 2012; KPMG, 2013; Alenezi *et al.*, 2015; Chanda and Ray, 2015). As such, researchers have been driven to consider alternative theoretical foundations of the project management discipline. Traditionally, the dominant paradigm underpinning project management's bodies of knowledge has been positivism (Bredillet, 2004). Positivism is associated with analytical philosophy which is characterised by quantification (Given, 2008), scientific empiricism (Pasch, 1959), and the ability to generalise (Critchley, 2001). We see this positivist or analytical thinking in the bodies of knowledge in the process flow diagrams that seek to provide a universal sequence of steps for various knowledge areas. To the uninformed, one could be mistaken to believe that following these project management body of knowledge processes would be sufficient to deliver project work.

Since 2006 and the Rethinking project management network (Winter *et al*., 2006), there has been growing discourse on alternatives to these traditional positivist foundations. The proposal of project management as "becoming" rather than "being" (Lineham and Kavanagh, 2006; Chia, 2013) is one such example. Furthermore, Cicmil (2006) discusses the benefits of a critical and interpretivist approach to studying the discipline. A continental, and particularly Heideggerian project management paradigm is also proposed by van der Hoorn and Whitty (2015), van der Hoorn and Whitty (2016) and van der Hoorn (2016). We now discuss this particular perspective in detail as it provides an important paradigmatic base for the SyLLK model.

The foundations of a continental perspective of project managing

The continental perspective of project management is grounded strongly in German philosopher Martin Heidegger's (1967) magnum opus *Being and Time*. This monograph proposes an alternative way of seeing the world, and provides a contrasting perspective to the positivist or analytical world view. A full discussion of *Being and Time* is beyond the scope of this chapter. However, we select some key concepts from the monograph which are critical to the alternative conception of project work that has been built by van der Hoorn and Whitty (2015;2016) and van der Hoorn (2016).

Modes of being

Heidegger (1967) distinguishes between four modes of being: Dasein, ready-to-hand, unready-to-hand and present-at-hand. Dasein is the mode of being that is associated with human beings who have an ability to care about their world. Ready-to-hand refers to things that are useful to Dasein (Blattner, 2006). For a construction worker, their boots may be ready-to-hand in that they enable them to work safely in a construction environment. Often, ready-to-hand objects are transparent to us, we do not notice them and take them for granted. However, ready-to-hand objects can also become *un*ready-to-hand. If the boots become significantly damaged, they would no longer be able to *be* boots in terms of fulfilling their function of protecting the workers' feet in their work environment.

Present-at-hand is the mode of being where we consider objects in their decontextualized, atomistic and purely scientific way. To again use a construction worker's boots as an example, if we examine the object through a present-at-hand lens we would take a physical measurement of the length, describe its colour and even measure its weight. However, this mode of being excludes the context of what this object is for and the environment in which it fulfils its purpose.

Being-in-the-world and equipmental totalities

Another central concept in Heidegger's (1967) *Being and Time* is 'being-in-the-world'. This concept highlights that Dasein and objects *beingness* is contextual. Heidegger argues that a humans beingness is infused with their environment (Schatzki, 2005; Blattner, 2006). It is not possible to detach ourselves from our environment to see phenomena 'objectively'. In terms of project managing, van der Hoorn and Whitty (2015), highlight that "[t]o increase our understanding of the 'lived experience' we need to recognise the inextricable coupling, and recursive feedback relationship between Dasein and [all they interact with], and seek to reveal rather than ignore the criticality of this relationship and interrelatedness."

According to Heidegger, we use *ready-to-hand* equipment (from here we will call them 'in-order-tos) to achieve what is important to us (Dreyfus, 1991; Haugeland, 2013). These in-order-tos are not just single physical objects in isolation; they are the contextualised 'stuff', the component parts, that create the various 'equipmental totalities' (or worlds) in which we exist. We may have our work equipmental totality, and our home-life equipmental totality. A car that we can drive between places may be an example of an 'in-order-to' that is part of both our home and work equipmental totalities. Our car is 'in-order-to' get from one place to another. This concept of in-order-tos and equipmental totalities is critical in the continental perspective of project work. Figure 6.2 is a simplistic representation of an equipmental totality with its in-order-tos. It highlights that each organisation, is a group of Dasein, with various in-order-tos making up and equipmental totality that enable the organisation to have an overall capability or set of capabilities.

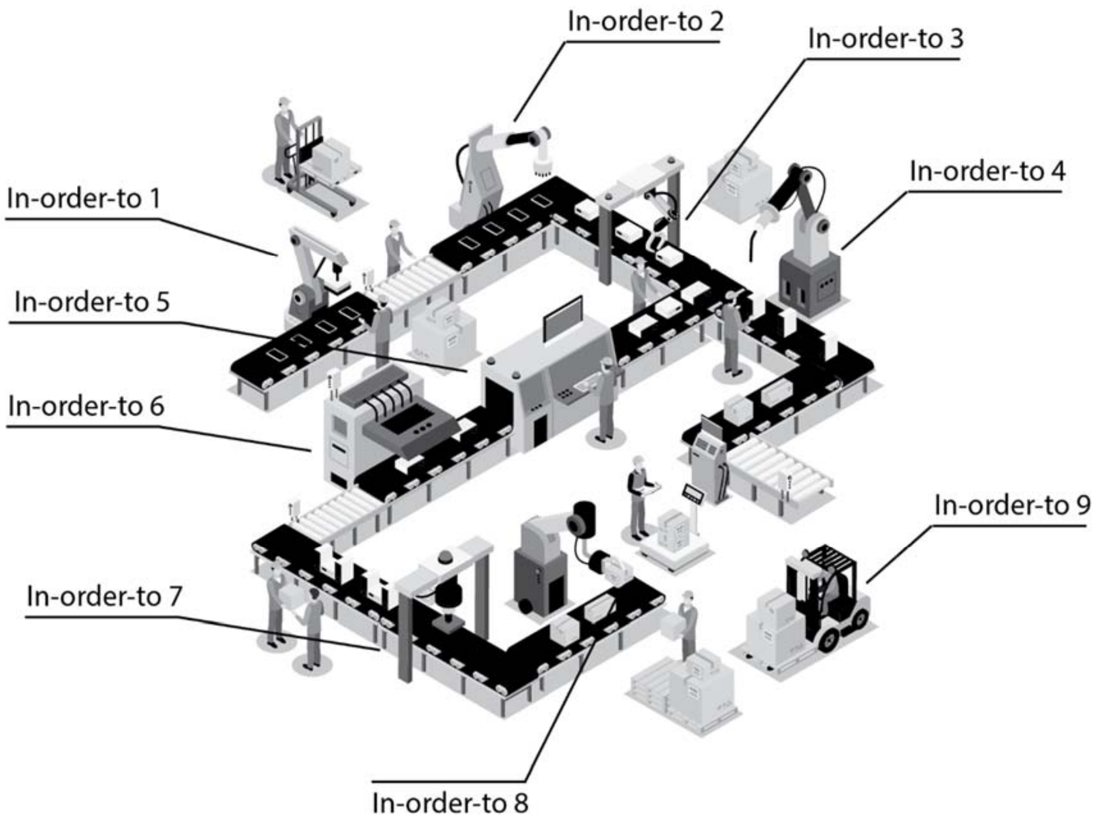

Figure 6.2 - A simple equipmental totality with its in-order-tos

The continental perspective of project work

van der Hoorn and Whitty (2015), based on the concepts in *Being and Time*, provide an alternative conception of what project work is. They propose that:

1. An organisation is an equipmental totality composed of various in-order-tos

2. At some point the equipmental totality (organisation) becomes, or is expected to become unready-to-hand. This may mean that a single in-order-to has become broken or needs changing, or there may be a more widespread issue impacting multiple in-order-tos.
3. If this occurs, and the equipmental totality (organisation) does not have the ability within it to restore or change the required in-order-tos, the experience of *project work* commences.

To put this perhaps another way, project work occurs where some aspect (and in-order-to) of the organisation (equipmental totality) is broken or requires change, and the organisation does not have the inherent ability to make this repair or change.

We note, that van der Hoorn and Whitty (2016) highlight that this inherent ability to restore the equipmental totality is not binary. This concept is grounded in Dawkins (2004;2011) discussion of discontinuous and continuous thinking. Dawkins highlights the problematic nature of categorisation (discontinuous thinking) and that categorisation of values into groups can falsely imply similarities and difference that do not exist in reality.

For project work, van der Hoorn and Whitty (2016) note that this inherent ability to restore or change the equipmental totality is not a binary. Rather than the situation being 'able or not able' to restore or change, it is instead like being 'more or less able' to restore or change. This means that there is not a discrete point at which the inherent ability to restore or change becomes project work rather than operational work, but rather work is on a spectrum of being more or less projecty, relative to the ability of the organisation to restore in-order-tos or make changes to in-order-tos within the equipmental totality (refer Figure 6.3).

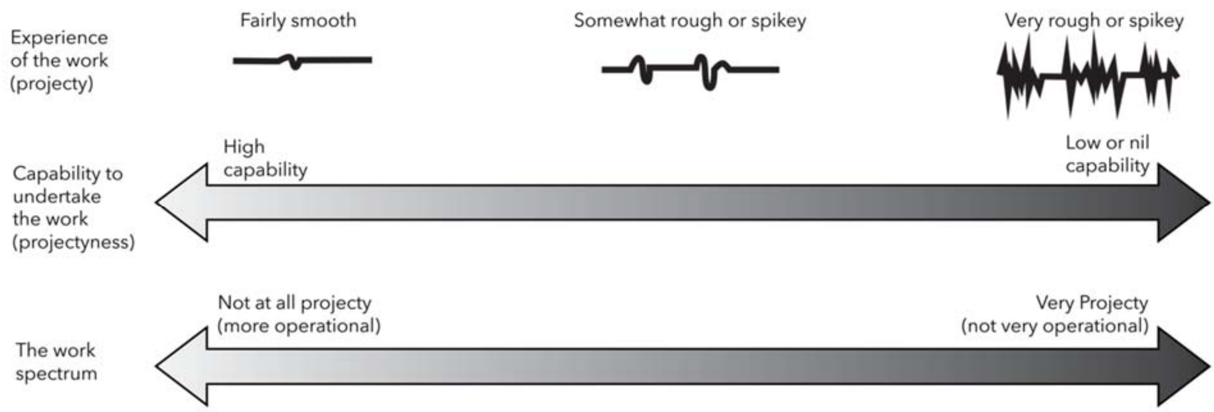

Figure 6.3 - The projectyness spectrum (Adapted from: van der Hoorn and Whitty (2016))

The SyLLK model

In the previous section, we identified that project work occurs when an organisation cannot inherently adapt their equipmental totality to achieve some required change or restoration to their capability. The Systemic Lessons Learned Knowledge or SyLLK model is a tool that enables us to identify and visualise the features of the organisation that will either facilitate or hinder the repair or change to the required in-order-tos, which all together facilitate organisational capability (van der Hoorn *et al.*, 2016). To accompany our discussion of the SyLLK model in Table 6.1 a glossary of terms relating to the SyLLK model are provided.

Table 6.1 - SyLLK model glossary of terms

Term	Description
System	A group of similar features in the SyLLK model. The six SyLLK systems are: learning, culture, social, technology, process and infrastructure.
Equipmental totality	The organisation being examined. It is all the in-order-tos required to deliver the capability.
Capability	The means towards the ends to deliver the products and/or services.
Quality	An expression of a capability that can be perceived or experienced through our senses. Qualities require certain features to be present across many 'in-order-tos'.
In-order-to	A fusion of features from across the SyLLK systems that deliver a component of a broader capability.
Feature	An attribute of one of the SyLLK systems. It may either hinder or facilitate the in-order-to.
Facilitator	A feature that enables or supports the in-order-to.
Barrier	A feature that constrains or hinders the in-order-to.

A systemic view of an organisation

The tool takes a systemic view of the organisation in that it considers the organisation as a set of systems. According to the SyLLK model there are six systems in an organisation. They are: learning, culture, social, technology, process and infrastructure (Duffield and Whitty, 2015)(refer Figure 6.4). Any 'in-order-to' in an organisation (equipmental totality) is a fusion of these systems. An organisation's SyLLK is analogous to a systemic view of the human body. The systems in the human body include the respiratory, circulatory, digestive, nervous, endocrine etcetera. For the human body to perform in a particular way it needs each of these systems to interact with each other in a specific way. If there is damage to, or an encumbrance on any of these systems, then the ability for the human to perform in a particular way may be diminished. It is important to highlight that there is no 'flow' in the SyLLK model. That is to say that nothing is moving through the holes or circles in the SyLLk model diagram (see Figure 6.4). Rather, the circles or holes in the SyLLK model represent the various features of each system which when coupled or fused form an in-order-to.

Figure 6.4 is an illustration of how in-order-to 1 is formed from the coupling of various features across the six systems. It also illustrates how in-order-to 2 is a fusion of other features across the six systems.

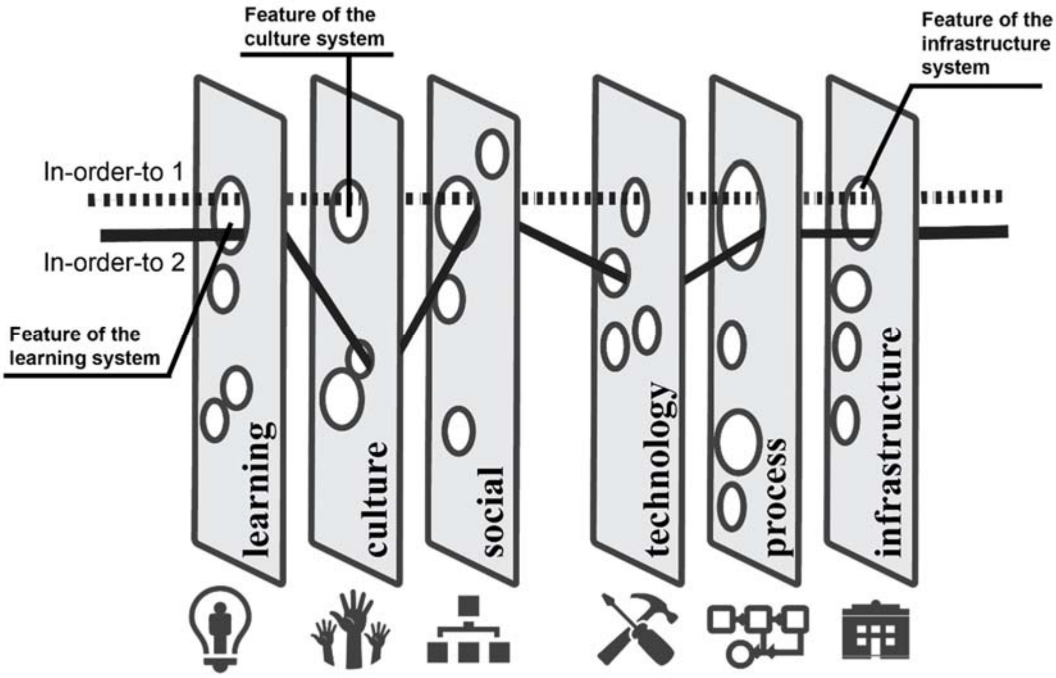

Figure 6.4 - The Systems of the SyLLK model (Adapted from: Duffield and Whitty (2015))

A conceptual reversal of Reason's Swiss Cheese model

The SyLLK model is a conceptual 'reversal' of James Reason's Swiss Cheese model (Duffield and Whitty, 2015; Duffield, 2016). James Reason's Swiss Cheese model is a conceptual safety and accident prevention tool (Reason, 2000). Organisations using the Swiss Cheese model examine accidents or incidents that have occurred and put in place 'defence layers' to prevent the accident or incident occurring again (Duffield, 2016). These defence layers are preventative features distributed across the various systems in an organisation. In the Swiss Cheese model the holes represent a fallibility brought about by human or non-human error. Therefore, the likelihood of a repeat of the same instance is diminished because if one defence layer fails there are several other defence layers that would prevent the accident or incident occurring again in the same way.

In the SyLLK model, rather than trying to prevent an accident or safety incident from occurring we are seeking to ensure an 'in-order-to' is activated or continues to be activated. As such, it is necessary to ensure that all the features across the organisation's six systems (learning, culture, social, technology, process and infrastructure) are aligned in their operation to achieve the required behaviour of the in-order-to. If any one of these systems is a barrier or hindrance to the in-order-to functioning, the organisations capability is impacted.

To demonstrate an application of the SyLLK model, we will first take a simple example of a bakery producing a loaf of bread so that the principles are made clear, and then we will use a more relevant IPD setting. If we want to have the capability to bake a loaf we need more than just experienced bakers (a feature of the learning system). A baker without an oven or mixing equipment or ingredients (features of the technology system), or a temperature controlled workspace (a feature of the infrastructure system) will be hindered in their ability to bake a loaf of bread. Furthermore, there will need to be features in the social system such as allocation of tasks to different staff, and an interest or passion for baking (a feature of the culture system) for the capability to be actuated. For the purpose of this example we have selected just a few features across the various six systems which are required to facilitate the capability to bake a loaf of bread. However, what is important is that we have highlighted that the capability to bake a loaf of bread is distributed across the six SyLLK systems. A deficiency or hindrance in any of these six systems will impact on the bakery's capability.

The six SyLLK systems

Before progressing further, we will examine what type of features are included in each of the six SyLLK systems. Table 6.2 lists the six SyLLK systems and cue words when considering the type of organisational features belong in each system. In the following section of this chapter we will highlight examples of the features in each system to achieve the capability of IPD for an organisation.

Table 6.2 - SyLLK systems and their cue words

System	Cue words
Learning	Skills, Experience, Mastery, Insight, Craftsmanship, Judgements, Understanding
Culture	Focus, Intention, Ritual, What is important, Values, Priorities, Policy, Games, Beliefs, Theories, Folklore, Customs, Symbols
Social	Language (verbal and non-verbal), Roles, Formal & Informal Ways people interact, Humour, Events, Stories, Division of labour, Signs
Technology	Tools, Devices, Aids, Materials that have form or can be shaped, Artefacts that provide a practical function (exerts a shaping force)
Process	Order, Sequence of steps , Task dependencies, Temporality focus (timing), Method, Flow of information, Rule-set about creating/crafting form or shape
Infrastructure	Spaces, Buildings, Utilities, Physical Environment, Spatiality focus, How the environment directs people's movements and what they think about

The hierarchical nature of capability and in-order-tos

It is important that we highlight the hierarchical nature of capability and in-order-tos. We will use the example of a firm engaging in a highly complicated or complex project in which a high-tech special-purpose laboratory facility is to be built, safely, and on budget. An IPD approach is being adopted requiring a variety of collaborative activities to be undertaken. These activities or in-order-tos include: engaging with the specialised laboratory equipment manufacturer to collaboratively design the property with experts in the field of laboratory design; the in-order-to to work with others in developing a realistic and sustainable estimate of the construction costs; the in-order-to to procure goods and services that help the laboratory owner achieve their time-to-market for their products etc.

Now, within each of these in-order-tos there are further sub-levels of in-order-tos. For example, the capability to procure goods and services would include: the 'in-order-to' to maintain and support a software system for managing purchases; testing installation equipment as well as understand complex approval requirements and standards and a host of other specialised knowledge and expertise; and the 'in-order-to' to execute tendering collaborative IPD processes within a highly time restrictive window of opportunity that warranted the use of an IPD approach rather than conventional traditional fragmented and sequential brief-design-bid-build approaches.

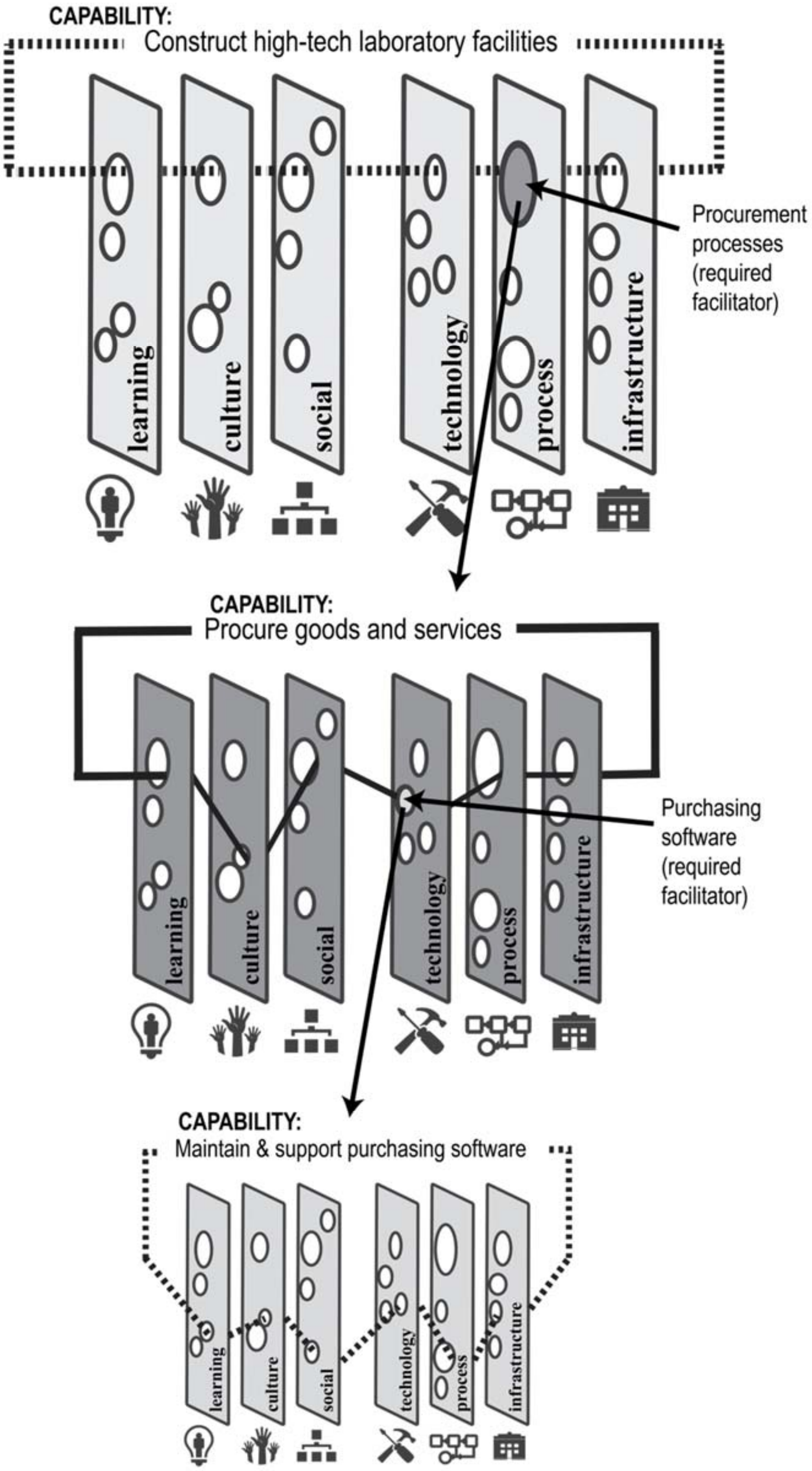

Figure 6.5 - The hierarchical nature of in-order-tos, each with their own capability

There are various levels of detail when we are discussing capability. When using the SyLLK model it is recommended that we use the level of detail that is useful for our purpose. Unless we are a very small organisation, it is unrealistic to create a SyLLK model for the entire organisation that incorporates all levels of ‘in-order-tos’.

The sensory quality of capabilities

Capabilities have qualities that can be experienced by us. Qualities refer to an expression of the capability that we perceive or experience through our senses. In our bakery example it might be an implicit assumption that the bread produced is tasty. If we are a construction firm developing a sophisticated high-tech laboratory for a client in an environment where it is vital for the client to beat its competition in a time-to-market sense, there may be an overarching quality of ‘working safely’. The rationale for this may be to ensure that the workforce experiences no accidents or critical incidents that may consequently harm them or reflect badly on the whole project team including the project owner and to ensure that no safety issues impede delivery of the project. These qualities will require certain features in the systems to be present across the many ‘in-order-tos’ in the organisation (refer Figure 6.6). In our construction example with the quality of ‘working safely’ we may have documentation that reports on near misses as being a feature in many in-order-tos across the equipmental totality. When a feature is present across many in-order-tos it is likely that it is contributing to a quality that we associate with the capability.

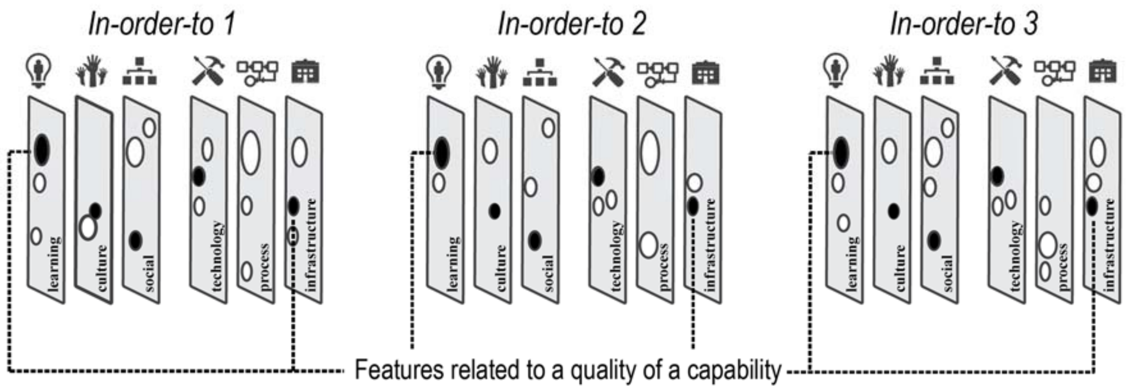

Figure 6.6 - The features required for qualities are often present across many in-order-tos

Integrating the SyLLK of different organisations

When we are considering a collaborative environment such as IPD, it is necessary to acknowledge that the six systems of different organisations will have points of interaction (refer Figure 6.7). For example, Organisation Aplha’s information sharing ‘in-order-to’ may or may not systemically align with Organisation Beta’s information sharing ‘in-order-to’. This could be particularly relevant with knowing what certifications, permits and other tests and evidence may be required for highly specialised laboratory fit out works. As such, for capabilities to be actuated within an IPD environment it may be necessary to consider how multiple organisation’s systems (when considered collectively) facilitate or hinder the IPD capability. We note here that the ability to temporarily couple and uncouple individual organisation’s systems to enable IPD is an ‘in-order-to’ in its own right. In fact, it may explain why particular organisations choose to continue working with the same group of organisations project after project. We could say that they have established that their systems can merge to derive good outcomes for all involved.

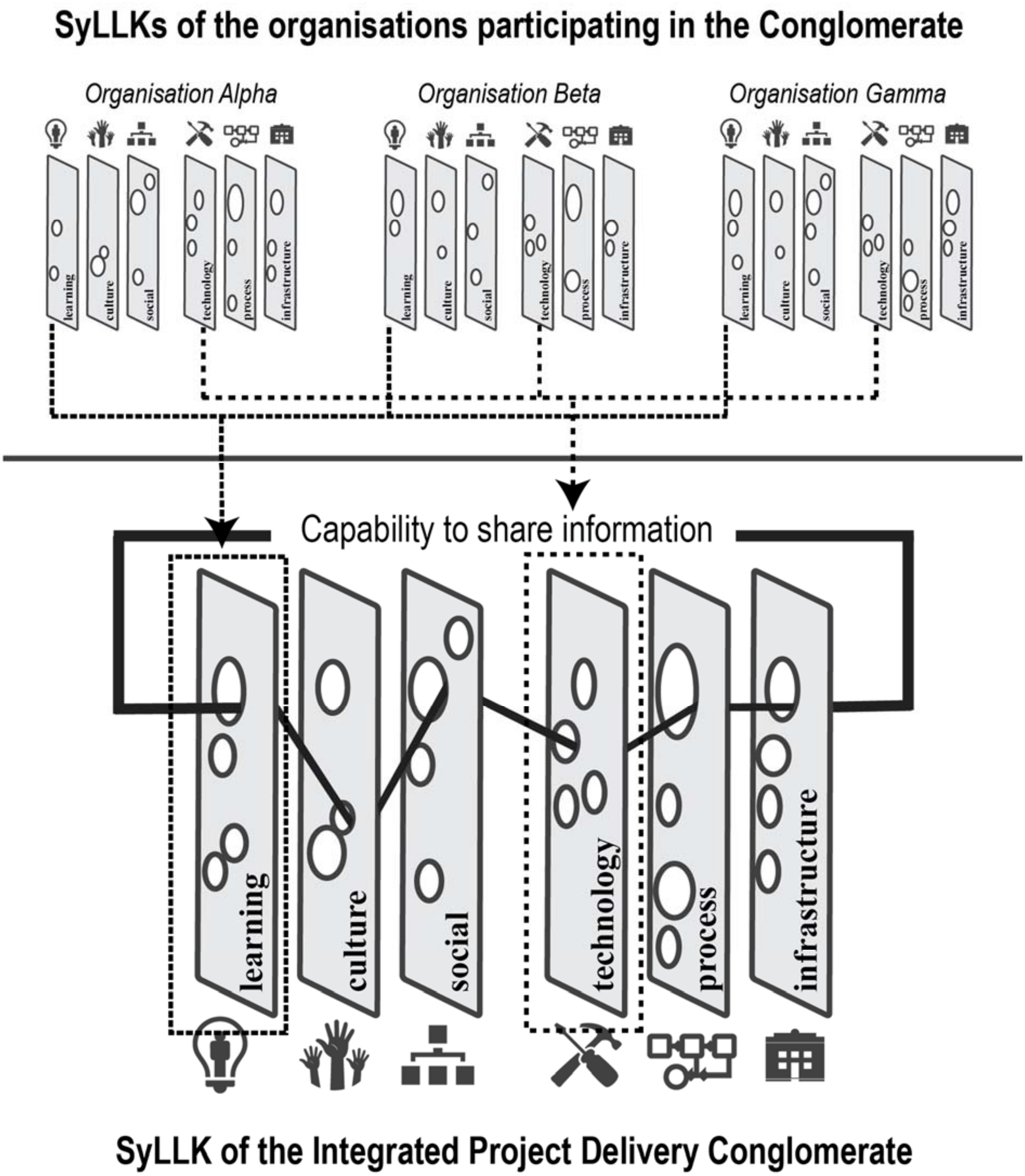

Figure 6.7 - Intersecting SyLLK systems

Using the SyLLK model for IPD

The SyLLK model can be applied to IPD in various ways. Firstly, the SyLLK model can assist to identify and visualise the facilitators and barriers for an individual organisation to have the capability to perform integrated project delivery (as opposed to traditional project delivery practices). If an organisation is embarking on project work and wants to adopt an IPD approach, it is likely that they will need to review whether their organisational systems align with the in-order-tos (capabilities) required in IPD. Qualities of IPD such as collective trust may not be inherently wired across an organisation's six systems. It is necessary to identify what is required to facilitate IPD across an organisation's systems and to ensure that there are no (or to minimise) the hindrances to this IPD quality. Furthermore, there may be a specific in-order-to within IPD such as developing, maintaining and sharing building plans and documentation that will require various facilitators from across the six SyLLK systems. We will discuss the facilitators for both these examples in the following section.

Secondly, the SyLLK model can assist an organisation to audit its systems to achieve a specific project's set of deliverables. Irrespective of the delivery approach, as introduced in the previous section, we experience work as projecty, because we do not have the inherently ability to undertake the activity. As such, the SyLLK model is useful to identify what will be required in each organisational system to achieve the project deliverables, then to audit the organisations existing features against this model. Gaps in required features can then be identified and remediated and barriers or hindrances to achieving the deliverables mitigated or removed.

Finally, and this is a combination of the first and second use in a broader context, if a conglomerate of organisations embark on IPD initiative, the SyLLK model can be utilised to ensure that the systems across the conglomerate organisations are aligned to achieve the IPD approach, and the project deliverables. As introduced previously, when organisations are working together, a hindering feature in one organisation's system can have an impact on the operation of the overall conglomerate's capability. In IPD, we are required to merge individual organisations systems (refer Figure 6.7) to enable the IPD 'in-order-tos'.

Using the SyLLK model to examine IPD

We will now examine both an IPD quality and an IPD in-order-to through the SyLLK model. Our aim is to demonstrate why a systemic view of capability is useful in enabling organisations to engage the capability of IPD. In our first demonstration we will identify and discuss the facilitators required for the quality of collective trust. In our second example we identify and discuss the features required for the in-order-to of developing, maintaining and sharing building plans and documentation. The identified facilitators for the quality and the in-order-to example have been drawn from three IPD case studies. The three case studies are Autodesk Inc., Cathedral Hill Hospital and Edith Green Wendell Wyatt Federal Building. The full narratives of each of these cases are detailed in School of Architecture University of Minnesota (2012) compilation of IPD case studies.

A form of thematic analysis (refer Gibbs (2007); Ayres (2008)) was used to elicit the facilitators in our two demonstrations of the use of the SyLLK model. The authors examined each of the three case study's narrative for features of the six SyLLK elements that were described as facilitating IPD capability. Following this initial classification of sections of the narrative to each SyLLK system, a second classification grouped the narratives with similar themes together. These secondary classifications are the identified facilitators in our examples.

The analysis revealed that there are multiple ways to facilitate the capability of IPD. Across the three case studies there were some differences in their ways of working. In SyLLK terms this means there is not a fixed set of facilitators required for the quality of collective trust, or the in-order-to of developing, maintaining and sharing building plans and documentation. However, there is a family resemblance in the facilitators that will be present. This means that whilst an organisation successfully undertaking IPD may not have all the facilitators we discuss in our examples, many of these facilitators or similar ones are likely to be present.

Example 1: Features required for the IPD quality of collective trust

To recall, in SyLLK terms a quality is an expression of the capability that we can perceive or experience through our senses. It is something we experience that is present across many in-order-tos in an equipmental totality.

It is broadly recognised that key principles of IPD include the alignment of the interests of all parties, equality amongst parties, collaboration, respect, and transparency (Kent and Becerik-Gerber, 2010; School of Architecture University of Minnesota, 2012; Fischer *et al.*, 2017). In examining the experiences described in three cases we would argue that these principles manifest themselves in a form of collective trust across the project parties. For more detail on the concept of trust and the IPD perspective of trust and commitment readers are referred to Chapter 13 of this book. The words of Hume (1740, sec. 3.2.5) capture this collective trust experience:

> '…when each individual perceives the same sense of interest in all his fellows, he immediately performs his part of any contract, as being assured, that they will not be wanting in theirs. All of them, by concert, enter into a scheme of actions, calculated for common benefit, and agree to be true to their word; nor is there any thing requisite to form this concert or convention, but that every one have a sense of interest in the faithful fulfilling of engagements, and express that sense to other members of the society.'

Through the SyLLK model it is possible to see that achieving this quality of collective trust requires the coupling of many features across the organisational systems. The IPD parties require more than simply a belief that collaboration, transparency or respect is important as has been explained in Chapter 2 of this book through the Collaborative Framework. They will require features across all the organisational systems (learning, culture, social, technology, process and infrastructure) to create this experience of collective trust which is such a defining quality of IPD. In Table 6.3 the facilitators in each SyLLK system associated with the quality of collective trust are listed. We will now examine why it is the coupling of these facilitators that actually awakens the quality of collective trust.

In the culture system, priority is given to respecting all team members (refer C1) and focusing on win-win (C4). However, this valuing or belief alone will not provide an experience of collective trust. This belief becomes awakened when teams are structured to allow autonomy (S1) and experts are structured to work together to solve problems (S3). However, even these cultural and social facilitators alone do not guarantee an environment of collective trust. Trust requires our exposure to being vulnerable and having a dependence on others for our fate (Kramer and Tyler, 1996) as is explained and expanded in the discussion in Chapter 13 and in particular illustrated in Figure 13.1 in that chapter, so we want to know that those we are exposing ourselves to have high degrees of experience and can be trusted to provide informed recommendations. This aligns with facilitator L1 (domain experience and knowledge). We also see that decision-making processes need to reflect the valuing of experts' opinions through making decisions in a democratic way (P2). The experience of collective trust would be diminished if decisions were made by a single person without regard to the opinion of experts. It would be saying something very different to our professed values of respect (C1) and win-win (C4). Technology facilitators such as Building Information Modelling (T1) and system integration and interoperability (T4) also contribute to the quality collective trust. These technologies make information visible and therefore increase feelings of inclusion in the project experience and therefore willingness to be vulnerable. Finally, co-location of the project team (I1) and spaces that encourage face to face engagement (I4) contribute to the conditions for realising collective trust. This works as the majority of interactions include both the verbal and non-verbal communication signals as the interactions are in-person. Problems can be more quickly addressed through quick and informal conversations and when misunderstandings occur these are more quickly identified and resolved.

To further explain, a facilitator in the learning system is IPD experience and knowledge (L3). We can structure people in teams to work together (S3), but if they don't have experience or knowledge of how to work in this way the structure will be ineffective. This drives the need for people to have skills or experience in coaching and mentoring (L5) to enable those who are new to IPD to be orientated into IPD ways of working. To return to the structure of different disciplines working together (S3), for this desire for collaboration to be optimally effective it is necessary for project team members to be as involved as early as possible in the project lifecycle (P3). If there is not early and consistent involvement (P6) the required shared understandings between the team members becomes hindered.

Whilst we have not discussed the coupling of every facilitator identified in Table 6.3 we have explained that the facilitators do not achieve collective trust in isolation. Rather the facilitators achieve collective trust because of their coupling. There will be IPD cases where some of these facilitators are not present. However, we propose that the greater the number facilitators in Table 6.3 (or appropriate substitutes) the greater likelihood that the quality of collective trust is achieved.

Table 6.3 - Facilitators in SyLLK systems to achieve the quality of collective trust

Learning	Culture	Social	Technology	Process	Infrastructure
L1: Domain experience and knowledge L2: Supplier and market experience and knowledge L3: IPD experience and knowledge L4: Problem solving skills L5: Coaching and mentoring experience and skills	C1: Valuing and respecting the contribution of all team C2: Belief in self-selection and accountability C3: Belief in the value of IPD C4: Focusing on win-win C5: Belief in open communication C6: Prioritising building productive relationships	S1: Teams structures embed autonomy S2: Contracts have shared risk-reward structure that incentivises building agreement. S3: Experts from different disciplines work together with the owner to plan and resolve problems. S4: Information is presented clearly and made easily accessible.	T1: Building Information Modelling Software T2 Managerial tools T3: Remote access to information T4: Computer system integration and operability T5: Computer servers and hardware	P1: Project processes include continuous improvement P2: Project processes allow for democratic decision-making P3: Project processes invoke involvement of as many parties as possible as early as possible. P4: Project processes favour a detailed design stage prior to commencing construction P5: Project processes for ongoing monitoring and review P6: Project processes favour high degree of ongoing engagement of relevant team members P7: Project processes are responsive and flexible P8: Processes are established for use of BIM and management of documentation	I1: Co-location of team I2: Internet connectivity I3: Onsite office facilities I4: Spaces that encourage face to face engagement I5: Spaces that enable the display of visuals I6: Virtual spaces

To summarise, to achieve this quality of collective trust the facilitators across various organisational systems (refer Table 6.3) will need to be aligned to derive the emergent quality we experience as collective trust.

Example 2: Features required for in-order-to of developing, maintaining and sharing building plans and documentation

Building information modelling (BIM) is strongly associated with IPD (Azhar, 2011; Bryde *et al.*, 2013). It is easy to think of BIM capability as simply setting-up autocad software. However, if we employ the SyLLK lens we would identify ‘developing, maintaining and sharing building plans and documentation’ as an in-order-to in the IPD equipmental totality and developing, maintaining, and sharing building plans and documentation is the purpose of BIM. With this more systemic and holistic view we recognise that this in-order-to is actually a nexus of the six SyLLK systems. It includes the autocad software but the in-order-to of developing, maintaining, and sharing building plans and documentation requires the coupling of several other facilitators from across the six SyLLK systems.

Table 6.4 - Facilitators for the in-order-to of developing, maintaining, and sharing building plans and documentation

Learning	Culture	Social	Technology	Process	Infrastructure
L1: Domain experience and knowledge L3: IPD experience and knowledge	C1: Valuing and respecting the contribution of all team C5: Belief in open communication	S3: Experts from different disciplines work together with the owner to plan and resolve problems. S4: Information is presented clearly and made easily accessible.	T1: Building Information Modelling Software T3: Remote access to information T4: Computer system integration and operability T5: Computer servers and hardware	P5: Project processes for ongoing monitoring and review P6: Project processes favour high degree of ongoing engagement of relevant team members P8: Processes are established for use of BIM and management of documentation	I2: Internet connectivity I5: Spaces that enable the display of visuals I6: Virtual spaces

From Table 6.4 it is evident that in addition to the technology facilitators for the in-order-to such as the software (T1), remote access to the software (T3), interoperability of systems (T4) and hardware (T5), other facilitators across the other systems need to be enabled. Team members are required who have experience and skills using the BIM software in an IPD environment (L1 and L3). Similarly, the desired benefits of BIM such as building a shared understanding and assisting in preventing and solving problems are achieved as the project team places value on open communication (C5) and the worth of diverse perspectives (C1). A sole architect could use BIM but it is in opening the system to the broader team that the benefits are derived. Again, the need for an in-order-to that is focussed on sharing building plans and documentation is coupled to an expectation that teams will work together (S3) and there will be transparency and easy access to information (S4).

For the effective operation of the developing, maintaining, and sharing building plans and documentation in-order-to the discussed facilitators also need to be coupled to enabling processes. There needs to be processes around how the software is to be used for designing, maintaining, and sharing plans and documentation (P8). The software will also need to be coupled and aligned with the project monitoring and review (P5) and engagement processes (P6). For example, if the BIM cannot be updated in real-time this would impact on the ability for timely monitoring and also the resolving of problems. Infrastructure facilitators will also be important in designing, maintaining, and sharing plans and documentation. Team members will need internet connectivity (I2) to enable access to the information in the system. The in-order-to is also likely to be more effective if there are spaces where the plans and documentation can be shared in a hard copy form in workspaces (I5). Finally, we recognise that the BIM creates a virtual version (I6) of the project deliverable and this creates a virtual infrastructure or environment in which planning and problem solving becomes easier.

In this example of the SyLLK for the designing, maintaining, and sharing building plans and documentation in-order-to we have again demonstrated the value in systemic thinking when considering what is required to be successful in IPD. It would be easy to assume that having BIM software configured would be the key facilitator, but by employing the the SyLLK model we highlight that this must be coupled with facilitators across the other organisational systems for the designing, maintaining, and sharing of building plans and documentation to be efficiently realised. A deficiency in any of the facilitators will hinder the in-order-to and likely negatively impact the overall capability of IPD.

The astute reader will have noticed that the facilitators for our second example are also present in our first example of the SyLLK for the quality of collective trust. This is an important point to notice. Across an equipmental totality's in-order-tos there will be many shared facilitators. For example, domain experience and knowledge (L1) is likely to be critical to nearly all in-order-tos for IPD and is also foundational to the achieving the experience of collective trust amongst the project participants.

Conclusion

In this chapter we have demonstrated how thinking systemically about organisations through the use of the SyLLK model can be valuable in identifying what is required to facilitate IPD capability. We commenced by providing an overview of key terms in systems and systems thinking. We then introduced the continental perspective of project managing that established the concept of organisations as equipmental totalities with in-order-tos and that projectyness is the experience brought about by having our inherent capabilities stretched.

Grounded in our knowledge of complex adaptive systems and systemic thinking we then introduced the SyLLK model as a conceptual tool that could assist us in understanding an organisation's capabilities in a systemic way. By using the SyLLK model we see each in-order-to in an organisation as the nexus of the six SyLLK systems (learning, culture, social, technology, process and infrastructure). Within each of these systems there are features. If an in-order-to is to function successfully the required features across all the organisational systems need to be present and coupled. An absence of a required feature in any of these systems will hinder the in-order-to. We also discussed the topic of 'qualities of capabilities' and how these qualities also require facilitators across the in-order-tos.

We demonstrated the value of this systemic view in two IPD examples. Firstly, we discussed the facilitators required to realise the quality of collective trust, which is central to IPD. We then examined the in-order-to of designing, maintaining, and sharing building plans and documentation.

Again, we showed that facilitators from across all six organisational systems are required to enable this in-order-to.

To conclude, we return to the continental perspective of project work. If you are an organisation that wants to participate in IPD, then your organisational (SyLLK) systems will need to be configured in such a way as to enable that. If not, then the experience of IPD, for you and others, will be projecty. If an organisation wants to be IPD compatible or capable they will need to audit the features across all their organisational systems (learning, culture, social, technology, process and infrastructure) to ensure that the required facilitators are present, and any hindering features are removed. In this chapter we have presented some of the key facilitators required for the IPD capability as a start to this audit process. However, of greater importance and broader impact is the demonstration of how the SyLLK model enables us to realise that any organisational capability would rarely be enabled through 'switching on' or 'plugging in' a single feature (e.g. software or a new process) in an organisation. Instead we must recognise that organisational capability is realised through a network or nexus of coupled features. All those involved in project work can benefit from this systemic view. If we can think across all organisational systems, and recognise their coupling when planning and solving problems in our project work, we will have a greater likelihood of achieving our project deliverables.

References

Alenezi, A. R., Gandapur, M. S. J., Javed, A. and Demba, M. (2015). "Significant failure factor of higher learning institution projects." *International Journal of Computer Theory and Engineering*. **7** (3): 248 - 252.

Ayres, L. (2008). Thematic coding and analysis. *The SAGE Encyclopedia of Qualitative Research Methods*. Given L. M. Thousand Oaks, CA, SAGE Publications, Inc.

Azhar, S. (2011). "Building Information Modeling (BIM): Trends, Benefits, Risks, and Challenges for the AEC Industry." *Leadership and Management in Engineering*. **11** (3): 241-252.

Bak, P. (1997) *How Nature Works: The Science of Self-Organized Criticality,* Oxford, Oxford University Press.

Bar-Yam, Y. (1997) *Dynamics of complex systems: studies in nonlinearity,* USA, Addison-Wesley.

Blattner, W. (2006). Heidegger's 'Being and Time': A reader's guide. London, Continuum International Publishing.

Bloch, M., Blumberg, S. and Laartz, J. (2012). Delivering large-scale IT projects on time, on budget, and on value, http://www.mckinsey.com/insights/business_technology/delivering_large-scale_it_projects_on_time_on_budget_and_on_value, 5 April 2015

Bredillet, C. (2004). Beyond the positivist mirror: Towards a project management 'gnosis'. *International Research Network for Organizing by Projects-IRNOP VI*. Finland.

Bryde, D., Broquetas, M. and Volm, J. M. (2013). "The project benefits of Building Information Modelling (BIM)." *International Journal of Project Management*. **31** (7): 971-980.

Chanda, S. S. and Ray, S. (2015). Learning from project failure: Globalization lessons for an MNC. *Thunderbird International Business Review*, Wiley Subscription Services, Inc.

Chia, R. (2013). Paradigms and perspectives in organizational project management research: Implications for knowledge-creation. *Novel approaches to organizational project management research*. Drouin N., R. Muller and S. Sankaran. Copenhagen, Copenhagen Business School Press**:** 33-55.

Cicmil, S. (2006). "Understanding Project Management Practice through Interpretative and Critical Research Perspectives." *Project Management Journal*. **37** (2): 27-37.

Cicmil, S. and Hodgson, D. (2006). "New possibilities for project management theory: A critical engagement." *Project Management Journal*. **37** (3): 111-122.

Critchley, S. (2001). Continental philosophy: a very short introduction. Oxford, Oxford University Press**:** 149 p.

Dawkins, R. (2004) *The ancestor's tale: a pilgrimage to the dawn of life,* London, Weidenfeld & Nicolson.

Dawkins, R. (2011). “The tyranny of the discontinuous mind.” *New Statesman*. **19**: 54-57.

Dosi, G. and Marengo, L. (2007). “Perspective—On the evolutionary and behavioral theories of organizations: A tentative roadmap.” *Organization Science*. **18** (3): 491-502.

Dreyfus, H. L. (1991) *Being-in-the-world: a commentary on Heidegger's Being and time, division I,* Cambridge Mass, MIT Press.

Duffield, S. (2016). “Application of the Syllk model wiring an organisation for the capability of an online Community of Practice.” *VINE Journal of Information and Knowledge Management Systems*. **46** (2): 267-294.

Duffield, S. and Whitty, S. (2015). “Developing a systemic lessons learned knowledge model for organisational learning through projects.” *International Journal of Project Management*. **33** (2): 311-324.

Edelman, L. B., Chandrasekaran, S. and Price, N. D. (2009). “Systems biology of embryogenesis.” *Reproduction, Fertility and Development*. **22** (1): 98-105.

Fischer, M., Khanzode, A., Reed, D. and Ashcraft, H. W. (2017) *Integrating project delivery,* Hoboken New Jersey, Wiley.

Gibbs, G. R. (2007). Thematic coding and categorizing. *Analyzing Qualitative Data*. Gibbs G. R. London, England, SAGE Publications, Ltd**:** 38-56.

Given, L. (2008) *The SAGE Encyclopedia of Qualitative Research Methods,* Thousand Oaks, California, SAGE Publications Ltd.

Haugeland, J. (2013). Dasein disclosed: John Haugeland's Heidegger. Rouse J. Cambridge Mass, Harvard University Press**:** xl, 291 p.

Heidegger, M. (1967) *Being and time,* Oxford, Blackwell.

Holland, J. H. (1992). “Complex adaptive systems.” *Daedalus*. **121** (1): 17-30.

Holland, J. H. (1995) *Hidden Order: How Adaptation Builds Complexity* Reading, Addison-Wesley.

Hume, D. (1740) *A treatise of human nature: being an attempt to introduce the experimental method of reasoning into moral subjects,* Auckland New Zealand, Floating Press.

Jugdev, K. (2012). “Learning from lessons learned: Project management research program.” *American Journal of Economics and Business Administration*. **4** (1): 13.

Kauffman, S. (1993) *The origins of order,* New York, Oxford University Press.

Kent, D. C. and Becerik-Gerber, B. (2010). “Understanding construction industry experience and attitudes toward integrated project delivery.” *Journal of construction engineering and management*. **136** (8): 815-825.

Keshavarz, N., Nutbeam, D. and Rowling, L. (2010). “Social complex adaptive systems. A response to Haggis.” *Social Science & Medicine*. **70** (10): 1478-1479.

KPMG (2013). Project management survey report 2013, http://www.kpmg.com/NZ/en/IssuesAndInsights/ArticlesPublications/Documents/KPMG-Project-Management-Survey-2013.pdf, 22 March 2014

Kramer, R. and Tyler, T. (1996) *Trust in organisations,* Thousand Oaks, Sage Publications.

Lineham, C. and Kavanagh, D. (2006). From project ontologies to communities of virtue. *Making projects critical*. Hodgson D. E. and S. Cicmil. Basingstoke England, Palgrave Macmillan**:** 51 - 67.

McCarthy, I. P., Rakotobe-Joel, T. and Frizelle, G. (2000). “Complex systems theory: implications and promises for manufacturing organisations.” *International Journal of Manufacturing Technology and Management*. **2** (1-7): 559-579.

Oxford English Dictionary (2017). "systemic, adj. and n.". *Oxford English Dictionary,*, Oxford University Press.

Pasch, A. (1959). “Dewey and the Analytical Philosophers.” *The Journal of Philosophy*. **56** (21): 814-826.

PM Solutions Research (2011). Strategies for Project Recovery, http://www.pmsolutions.com/collateral/research/Strategies%20for%20Project%20Recovery%202011.pdf, 27 March 2014

Proctor, R. W. (2008) *Human factors in simple and complex systems,* Boca Raton FL, CRC Press.

Project Management Institute (2013). A guide to the project management body of knowledge. Newtown Square Pa, Project Management Institute.

Reason, J. (2000). “Human error: models and management.” *British Medical Journal*. **320** (7237): 768-770.
Rickles, D., Hawe, P. and Shiell, A. (2007). “A simple guide to chaos and complexity.” *Journal of Epidemiology and Community Health*. **61** (11): 933-937.
Schatzki, T. (2005). Early Heidegger on sociality. *A companion to Heidegger*. Dreyfus H. L. and M. A. Wrathall. Oxford UK, Blackwell Pub.
School of Architecture University of Minnesota (2012). IPD Case Studies.
Senge, P. (2011) *The fifth discipline fieldbook : strategies and tools for building a learning organization*, London, Nicholas Brealey Pub.
Smit, B., Burton, I., Klein, R. J. and Street, R. (1999). “The science of adaptation: a framework for assessment.” *Mitigation and adaptation strategies for global change*. **4** (3): 199-213.
Stacey, R. D. (2007) *Strategic management and organisational dynamics : the challenge of complexity to ways of thinking about organisations*, Harlow, Financial Times Prentice Hall.
Thomas, J. (2006). Problematising project management. *Making projects critical*. Hodgson D. and S. Cicmil. China, Palgrave Macmillan**:** 90-110.
van der Hoorn, B. (2016). “Continental thinking: a tool for accessing the project experience.” *International Journal of Managing Projects in Business*. **9** (4): 865-891.
van der Hoorn, B., Duffield, S. and Whitty, S. (2016). A 'lived experienced’ tool for managing and building project delivery capability. *ANZAM 2016*. Brisbane.
van der Hoorn, B. and Whitty, S. (2015). “A Heideggerian paradigm for project management: breaking free of the disciplinary matrix and its Cartesian ontology.” *International Journal of Project Management*. **33** (4): 721-34.
van der Hoorn, B. and Whitty, S. (2016). “Projectyness: A spectrum of greater or lesser capability.” *International Journal of Project Management*. **34** (6): 970-982.
Whitty, S. (2008). *'C' for craftsmanship not 'C' for complexity*. PMI 2008: PMI Global Congress Asia Pacific, Sydney, 3 - 5 March,
Whitty, S. and Maylor, H. (2009). “And then came Complex Project Management (revised).” *International Journal of Project Management*. **27** (3): 304-310.
Winter, M., Smith, C., Morris, P. and Cicmil, S. (2006). “Directions for future research in project management: The main findings of a UK government-funded research network.” *International Journal of Project Management*. **24** (8): 638-649.