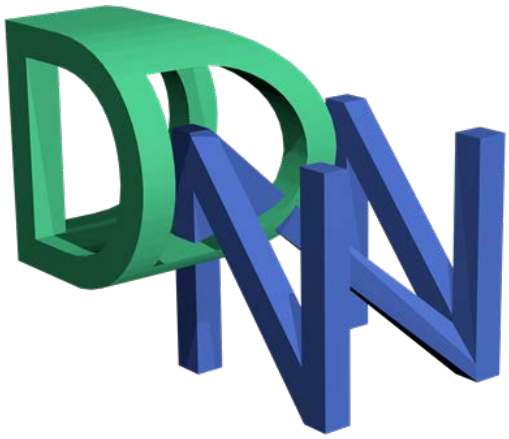
Fundamental Inputs to Process

A white paper by Dr Alan Dyer

14/01/2026



DyerNeed Pty Ltd

Contents

Mailing address: PO Box 162, Bungendore, NSW, 2621 - ABN 65 166 364 343 - Tel +61 4 1034 2771

Introduction

Document context

1. This document intends to describe a tailored approach to describing Fundamental Inputs to Capability (FIC) that are more suited to a process rather than a full Capability – the Fundamental Inputs to Process (FIP). This document is presented within the context of large capability programs.

Key definitions

2. This paper aligns with a previously defined enterprise architecture framework (EAF). For ease of discussion; the following terms are used generically in this document in the following way:

   a. The **state** of 'something' is a series of measured characteristics. A more general (non-architectural) definition is 'the condition of a person or thing, as with respect to circumstances or attributes'[i]

   b. An **effect** is the result, outcome, or consequence of an action. An effect can be described as a change in the state of a resource as a result of some activity.

   c. A **process** is formally defined in the BPMN standard as "A sequence or flow of Activities in an organization with the objective of carrying out work." The EAF considers a process to be synonymous to action, activity, task or workflow.

3. The concept of **work** is core to the description of states.

   a. In physics, entropy is a measure of disorder, and the Second Law of Thermodynamics states that all closed systems tend to maximize entropy.

   b. The level of disorder equates to a level of risk that desired effects or outcomes will not[ii] be achieved.

   c. For the purposes of this paper, **work** is the expenditure of resources (including energy) to either maintain or increase the level of order – working against an increase in disorder.

4. **Capability** is the power to achieve a desired operational effect in a nominated environment within a specified time and to sustain that effect for a designated period[iii]. This is a specialised definition based on the broader English usage which is the quality or state of being capable or a feature capable of being used or developed[iv], and the capitalised term 'Capability' will be used to denote the ODCS definition.

5. **Fundamental Inputs to Capability (FIC).** FIC are capability elements or inputs, which in combination, form the basis of capability. A more detailed description is in the Annex.

Why this white paper is important

6. The concept of a Capability is to achieve an operational effect. Many Defence acquisitions include support elements and enablers that don't deliver an operational effect in themselves.

7. Defence have adopted the One Defence Capability System (ODCS) as a means to systematically identify, prioritise, acquire, sustain and dispose of capability while delivering on Government's strategic intent[v]. However, the ODCS is treated effectively a 'one size fits all' approach. Figuratively, this is an updated 'hammer' in the context of Defence acquisition, and is used for any capability-related project (the 'nail').

8. But not all acquisitions need to address the full range of fundamental inputs – indeed, some acquisitions only address part of the FIC; the ability to properly tailor the ODCS approach and the fundamental input framework can reduce the work required to get to approvals. This white paper addresses one example of such tailoring.

Can we just call it Capability anyway?

9. Examples of processes that this white paper is addressing are those decision-support activities that are used to tie together multiple Capabilities for strategic effect. Three obvious examples are planning and two support processes: intelligence and targeting.

10. The key elements for Capability are: 'desired operational effect', 'nominated environment' and 'designated period'. The FIC, as described in further detail in the Annex, are the roles, processes, rules, resources and descriptions of states and effects that are necessary for effective Capability. Each fundamental input does not work in isolation, and these relationships can be easily determined (Figure 1).

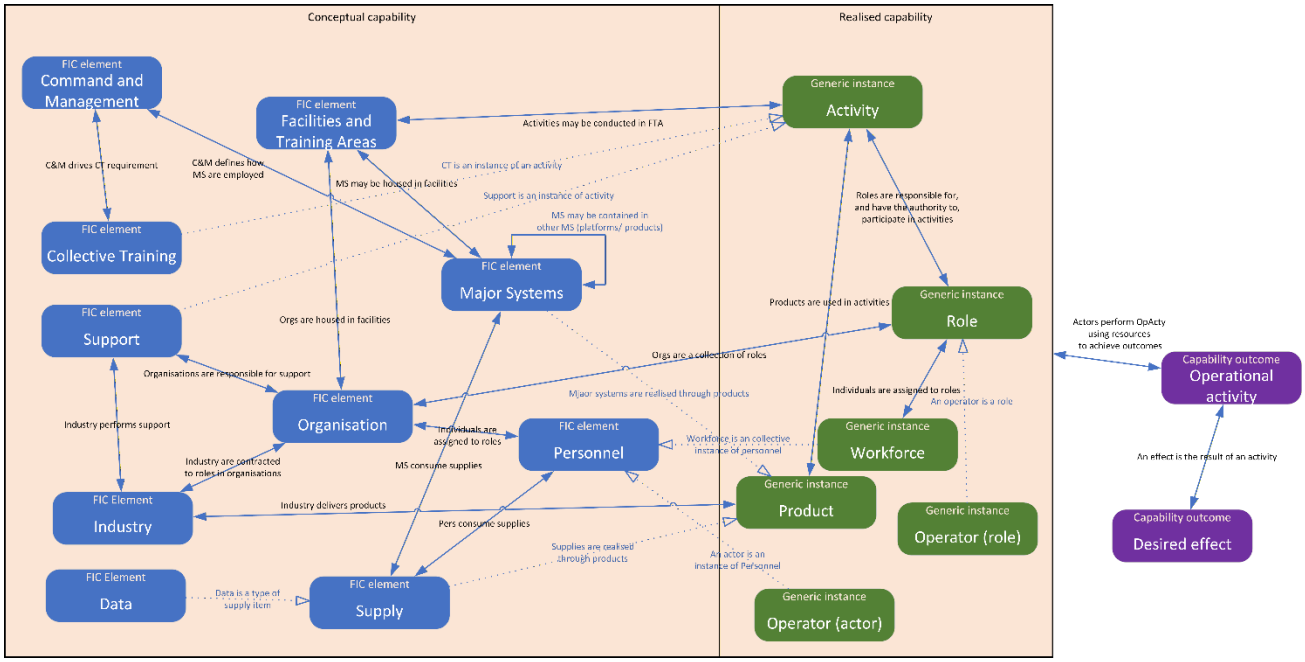


Figure 1: FIC relationships

11. Figure 1 does not include the dimension of time, which is a critical input to any activity. The only FIC elements that can directly create the desired effects are Personnel and Major Systems. The only physical FIC elements (resources) are Personnel, Major Systems, Supplies and Facilities/Training Areas. The remainder are abstract constructs that frame the employment of resources to achieve the outcomes. For the three exemplars provided in paragraph 9:

a. Planning is a Command and Control (Command and Management) activity that defines the outcomes, probably through the orchestrated use of multiple Capabilities.

b. Intelligence is a support activity, primarily to support planning of all flavours (but also has other audiences)

c. Targeting can be a Support or Command and Management activity, depending on the context. The nature of targeting, and its relationship with planning, means that it is more aligned with a case management philosophy rather than being a strict process.

12. When viewed from the perspective of the Capability, intelligence and targeting provide discrete information products that can be used in planning or as configuration for major systems. From this perspective, these two can also be seen as a class of supply – data (Data FIC under the current ODCS framework – see the DyerNeed white paper on '*Data – supply item or a Fundamental Input in its own right?*').

13. Regardless of the perspective taken, addressing an activity that is not specific to a Capability does not make it a Capability in its own right – it is a 'glue' activity that sits between the Capabilities. The ODCS provides a framework that is tailored to large complex programmatic delivery (of Capability) with significant governance overheads.

14. Labels are important –(Sir) Francis Bacon wrote[vi] "*the ill and unfit choice of words wonderfully obstructs the understanding*". Calling a 'glue process' a Capability implies use of the large, potentially cumbersome, framework with all the associated delays and additional development costs. In some cases, the delays can be counted in years and the associated costs in the millions.

15. The antidote to these delays and additional costs is to simply recognise that supporting activities are not Capabilities in their own right. This doesn't make these processes any less complex, but it does ensure that any unnecessary baggage is not carried.

A tailored approach to fundamental inputs to processes

Anatomy of a process

16. The use of a recognised standard for describing processes helps remove ambiguity; in this case ISO 19510 (Business Process Modelling and Notation). For the purposes of this white paper, the focus will be on the basic task/sub-process elements and not on the gates or events. These latter two elements can be treated as transient abstract elements. Each task is defined in the terms of value-adding[vii] work. Figure 2 provides a perspective from external to the task, while Figure 3 provides an internal perspective.

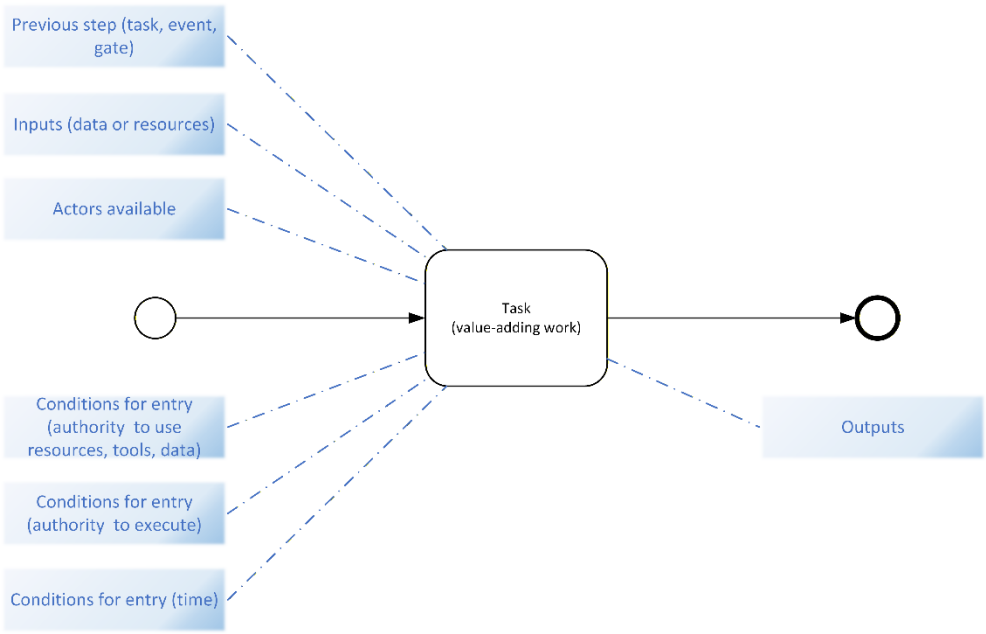


Figure 2: External perspective on task factors

17. The external factors reflect having the right environment and conditions for starting the task – and thus deriving an output. Realistically, the owner of the task may commence it with less-than-ideal conditions. Understanding this perspective allows the owner to understand those risks.

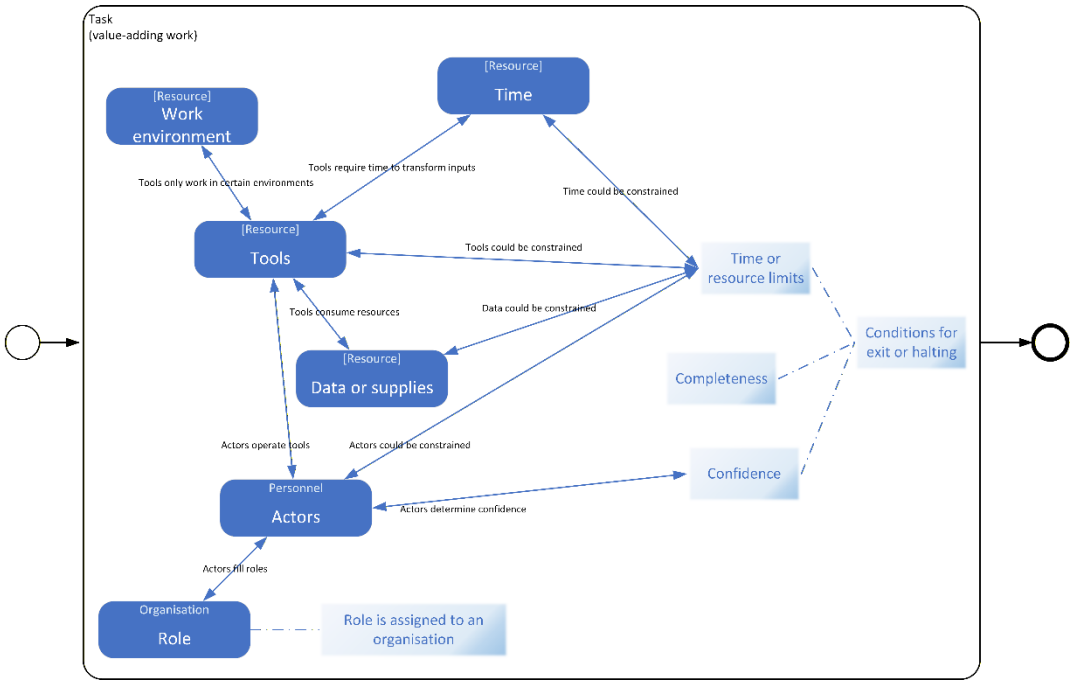


Figure 3: Internal perspective on task factors

18. The internal factors also reflect having the right environment and conditions for working the task – and thus deriving an output. Realistically, the workers may undertake it with less-than-ideal conditions. Understanding this perspective allows the owner to understand those risks.

19. Practitioners of business process modelling will observe that the figures above illustrate a single task. The factors shown will aggregate as the process grows, and the scale of aggregation will depend on the complexity of the process (including alternative paths). This white paper recognises this is a consideration but does not intend to explore the full mathematics.

The fundamental inputs

Overview of the fundamental inputs to a process

20. The anatomy of the task identifies that successful completion of the task requires a complex interaction of specific factors – roles and resources. These are the 'fundamental inputs':

a. *Time* is a **resource**.

b. ***Roles*** are a fundamental element of an organisation (See Annex A).

c. *Actors* are **resources** (usually tangible).

d. *Tools* are **resources**, in the vein of major systems.

e. *Work environments* are **resources**, that could include the built environment (facilities and training areas) for physical-based processes or an ICT environment for knowledge-based or virtual processes.

f. *Supplies* are **resources**, and could be physical supply items or data depending on the type of process.

21. The decision elements (including starting and ending conditions) are inherent in the process by definition (usually represented by gates and events). This could be considered as analogous to *Command and Management*.

22. Each process requires a level of *Support*, which is discussed separately.

Time

23. When planning processes, the potential demand on time is a consideration. The ability to compress the time demands by adding resources (or altering the configuration of tools) is an additional consideration, but some tasks cannot be compressed. Project management techniques cover this well. Time may be required to:

a. Await starting conditions (time between tasks)

b. Undertake work

c. Wait between phases of work (sub-tasks or sub-processes)

d. Wait for approvals to sign off on the work done.

e. Wait for the effect of work done to occur

24. For the purposes of this white paper, the focus is on the **available time** as the resource. Decision makers can provide windows of time to achieve outcomes, these are usually determined through a planning process. Sometimes, though, a process can be triggered by an external unplanned event and the available time will depend on the context.

25. Compromises are required when the demand on time for a process exceed the available time:

a. Additional resources can be used to reduce the overall time demand which has cost and management implications. Not all tasks are suitable for this approach, some tasks take a fixed amount of time regardless of resources or effort.

b. The task could be deemed 'finished' before all the work is complete.

c. The task could be completed, but to a lower standard or a lower level of confidence.

Roles

26. The architectural analysis of the concept of an organisation is that it is a framework of roles and their relationships. The full range of organisations is a key consideration when considering a Capability, but only the roles specific to a task are relevant when studying the process.

27. The role holds the authority to perform or participate in the tasks of the process. When an actor is assigned to the role, that actor (usually) assumes the authorities and delegations related to the role. This nuance means that processes can be designed independent of any personalities. In addition, the skills and training required to undertake tasks can be aggregated in relation to an organisation or other form of cadre.

Actors

28. Actors are those entities that operate the tools to perform the work – these can be either human actors (personnel with skills and experience) or automated agents (rules-based, machine learning or artificial intelligence). Non-automated agents are simply tools operated by actors.

29. Actors assume the authorities and delegations assigned the roles. The reason these are assigned to the roles in the first instance is based on 'needs' – there is no need to exercise the authorities and delegations unless performing the work.

30. The desired skills, experience and level of competence will depend on the task at hand. Compromises on completion (confidence and completeness) must be considered when an actor does not exhibit these skills, experience or competence.

Tools

31. Tools are items that facilitate transformation – reducing the effort required to achieve the work outcomes. Tools may not be unique to the task, and many tools may be needed for the work. As an example, if the task is removing an engine from a vehicle, then the tools could be an engine hoist, socket wrenches and an engine stand.

32. For the kinds of enabling processes that this white paper is focussed on, the tools are likely to be provided as part of a suite. The aggregation of requirements could result in a single tool (e.g. a software suite) that covers the full process – such monolithic toolsets have their own risks such as vendor lock-in).

33. Existing toolsets (obtained for different processes) could also be re-purposed for the chosen process; but this also depends on the individual tasks (e.g. removal of windscreen wipers for modern cars is made easier through a bespoke tool for each make).

Work environment

34. The correct environment facilities better outcomes. Servicing a vehicle is easiest in a well-equipped workshop even if this does not prevent the work from occurring on driveways and out in fields. The correct environment facilitates access to the tools and provides room for those tools to be used safely[viii].

35. For knowledge and decision processes, the right environment is primarily the right network, usually simply one that can execute the software (tools). Where security is a consideration, classified networks in appropriately secured facilities also become a consideration – but these could still be general support networks and operating environments that are suitable for multiple processes.

Supplies

36. The tools consume or transform materials to generate the nett value. For knowledge or decision processes, these materials are relevant datasets. Access to supplies (materials or data) is, thus, necessary for effective processes.

The relationships between these inputs

37. Like FIC, each of these fundamental inputs works together as illustrated in Figure 4.

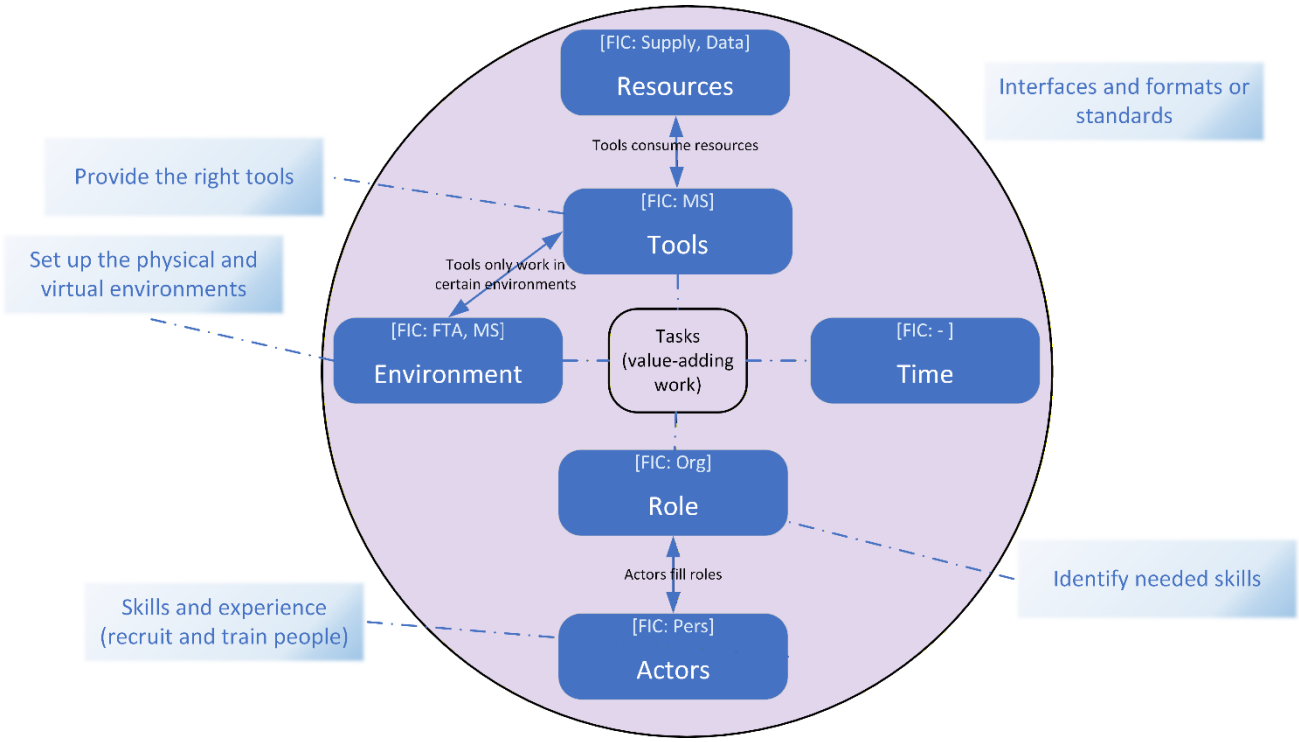


Figure 4: Relationships between the fundamental inputs to process

38. The Time, Tools, Environment and Role are usually the defining characteristic for each process. The Tools work in identified Environments and consume Resources. Actors fill Roles.

Mapping FIP to FIC

Direct elements

39. The FIC elements are described in the Annex.

40. Figure 5 illustrates how the FIP and FIC can be mapped. Some elements (ringed in green) have a clear relationship and don't need further discussion in this white paper. Some elements have no mapping (ringed in red) and the remainder have a partial mapping (ringed in orange).

a. Time, as an input to a process, is not reflected in FIC. This is not unexpected as a Capability represents a possibility of success and time is usually not a factor during definition.

b. Actors, if human, would be an example of Personnel FIC. However, the potential for non-human automated agents results in a partial mapping. Such automated agents may be acquired as Major Systems, but this is an area that requires further analysis.

c. A Role is an element of an Organisation FIC but does not include the overall role relationships that are significant in the organisation definition. As such, this is considered a partial mapping.

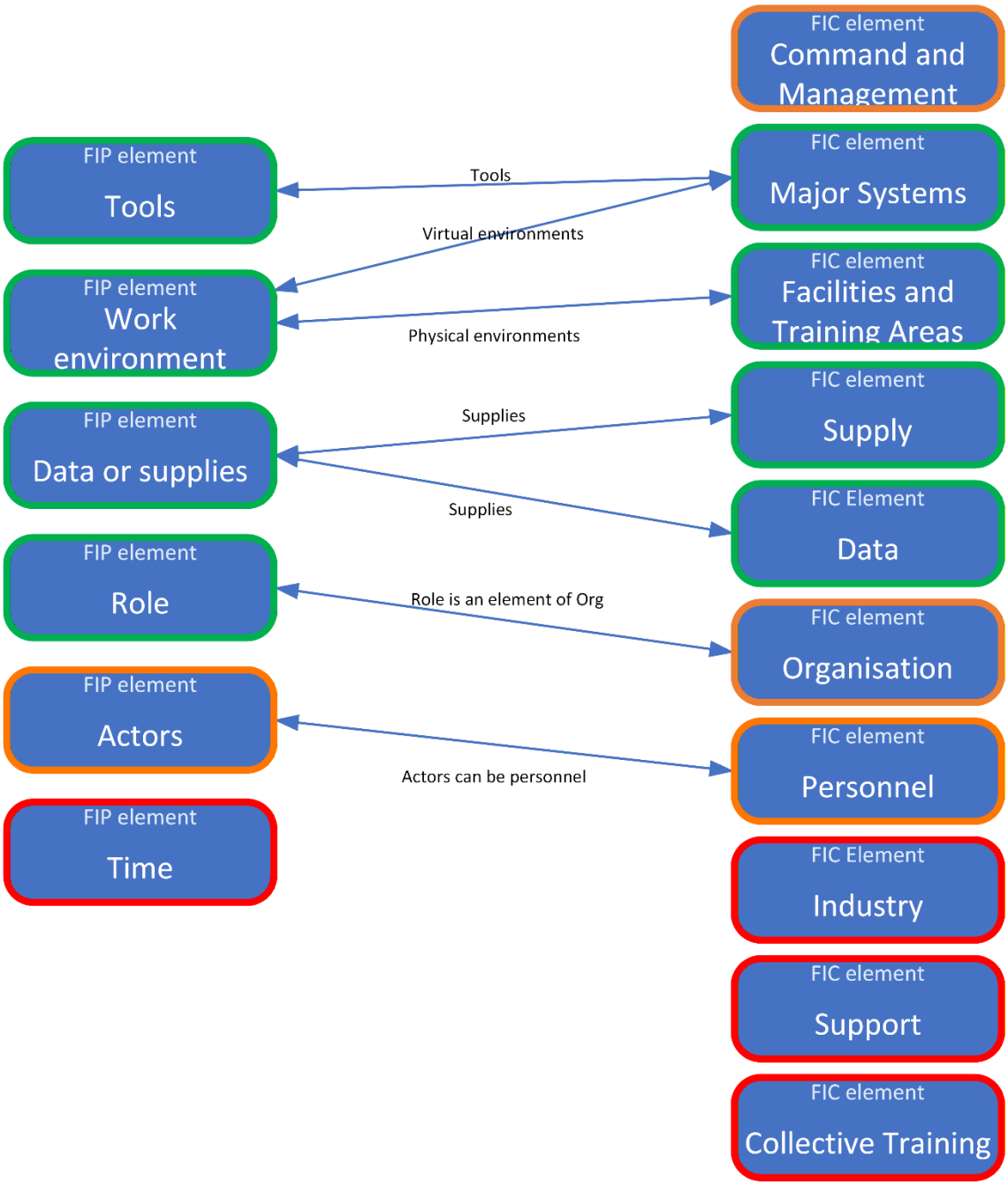


Figure 5: Mapping FIP to FIC

41. A process can be considered as an element of Command and Management FIC. The mapping is from the full process and not the fundamental inputs to the tasks. Depending on the process, the linkage could also be to the Support FIC.

42. The process elements do not have any obvious direct linkages with the Support, Industry and Collective Training FIC.

Support and collective training

43. Support and Collective Training FIC were not directly mapped to the process fundamental inputs. These two FIC elements do have a significant role in ensuring the effectiveness of the process.

44. Four main Support activities can be identified, three of which should be obvious and a fourth that is often underplayed.

a. Maintain the tools to ensure they remain safe, effective and fit for purpose.

b. Maintain the environment to ensure it remains safe, effective and fit for purpose.

c. Maintain the skills and competence of the actors (usually through training).

d. Maintain (and document) the process.

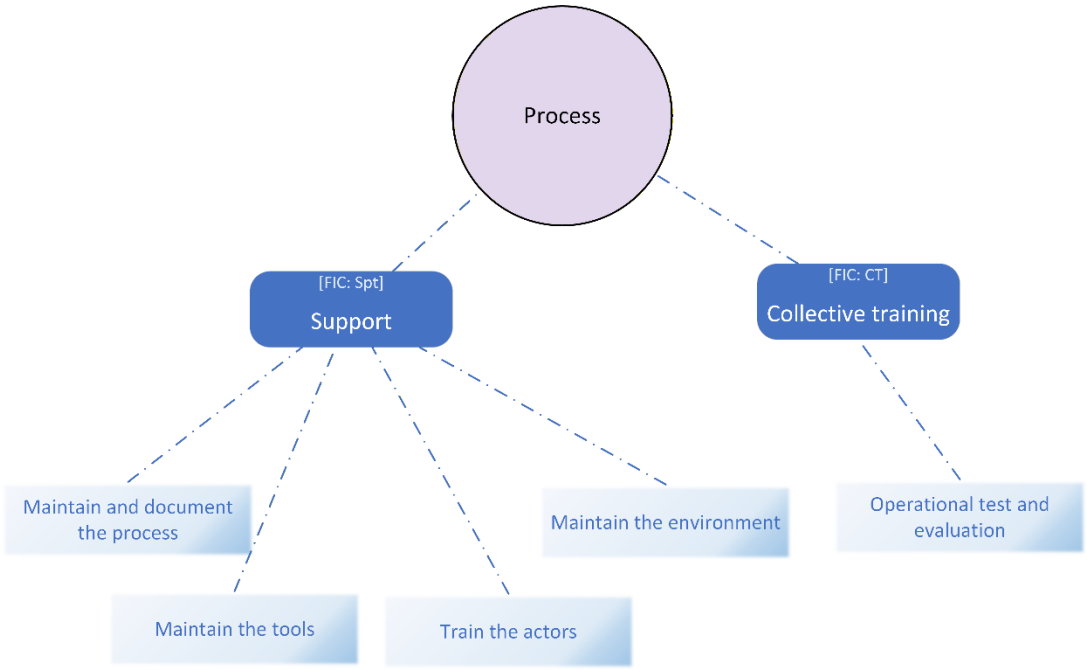


Figure 6: Support and collective training considerations

45. Typically, process growth is organic. People start by 'doing things' to achieve an outcome. These may then be quickly (and informally) documented to pass on to other people. Something changes so the process is modified to address this, and the new process is also passed on if needed. In organic growth, the process is most often not review for side effects and induced waste.

46. Defence's doctrine development activities exemplify the organic growth of processes. Doctrine is generally authored by practitioners, those who participate in the process rather than those who should oversee and manage the collective processes.

47. Understanding the FIP allows processes to be engineered, rather than organically grown – and older organic processes can be re-engineered. Engineering allows for confirmation of continuing fitness for purpose and consistency. Engineering also allows for considering how the selected process interacts (and interfaces and interoperates) with other processes or Capability.

48. The Collective Training FIC should usually call upon multiple processes to support a Capability. Processes could be rehearsed (for example during a Command Post Exercise).

Comparison – simplicity versus complexity

49. On the surface, the proposed FIP appears to be as complex as the FIC. Some significant differences exist:

a. Time is included because it is important to the description and execution of a process, but not necessarily so for a Capability.

b. Support, Collective Training and Industry are not so relevant to processes, and where they do apply, it will be on a much smaller scale. Collective Training will be applied to the process from an external perspective and not to select elements as would be for Capability.

c. The process focus is on the relevant Roles, not the full Organisation. The roles are likely to be part of an existing organisation, although definition work may identify organisational changes.

d. While the need for a skilled workforce is just as relevant, the FIP is focussed only on those Actors that perform the process and does not include the ancillary workforces that FIC (Personnel) requires.

e. The nature of Capability means a focus on complex multiple Major Systems. With FIP, only the specific Tools for each task are considered. This means that a smaller suite of possibly complex tools will be considered.

f. FIC does not consider the equivalent of the process environment; this would be the operational environment. However, FIC does imply additional environments which are focussed on support, collective training and organisations. For a process, the work environment will usually be an existing product with or without modifications and it is focussed on the tasks. This will be addressed on smaller scale than facilities, training areas or ICT environments would be for Capability.

50. The comparison shows that addressing FIP versus FIC reduces complicatedness in defining enabling processes.

Conclusion

51. Defence's FIC is used as a hammer, and all acquisition projects are the nails. In addition, Defence's acquisitions have evolved from a major systems/platform focus. A tailored approach for enabling and supporting processes allows for a focus on what is important and downplays the irrelevant elements.

[i] Macquarie Dictionary, first definition

[ii] Risk is adversity agnostic – the risk is really that stated outcomes will or will not be achieved.

[iii] As taken from the foreword to the One Defence Capability Manual issued March 2025

[iv] Chambers Dictionary 13th Edition

[v] As taken from the foreword to the One Defence Capability Manual issued March 2025
[vi] Novum Organum, sive Indicia Vera de Interpretatione Naturae (1620)
[vii] If a task does not add value, it should not be performed.
[viii] Process safety can be considered from a health or a security perspective.

Annex – What are 'Capability' and the Fundamental Inputs to Capability?

The capability perspective

52. A definition of capability is 'the power to achieve a desired operational effect in a nominated environment within a specified time and to sustain that effect for a designated period.' This is the definition used by Defence[ix] and is consistent with systems engineering best practice.

53. At the highest level, this could be considered 'the ability to do something' which is a common broad use of the word. Importantly, a Capability must be used within an operational activity to achieve that desired effect (Figure 7).

Figure 7: A simplified, but more nuanced explanation of capability and effect

54. Even this approach is simplified, because it implies that the whole of the capability is used directly in the operational activity –potentially leading the audience to think that capability is synonymous with technology systems. This approach also describes the capability in isolation as something with absolute and clear boundaries. The power to achieve something is not only contingent on the internal configuration of the capability, but also the external drivers over which the operators have no control.

55. Examining the definition of a capability in light of the non-controllable external influencers, a capability is a **probability** that an effect can be achieved in a given context and timeframe. This is consistent with the natural language approach when we describe that we may have a 'limited capability' to achieve a desired outcome.

What is a 'FIC'?

56. I have now identified that capability is defined in the terms of 'probability'. Until capability is tested in operations, the capability function is in an ambiguous state. Once executed in a real context, the capability function collapses to an actual outcome, which itself can be measured as a statistical degree of success.

Figure 8: Probability cloud perspective on capability and effect

57. The external factors are the obvious elements driving the final outcome. But the simplified approach to conceptualising capability described earlier ignores the large influence of the internal drivers. To describe this influence, a standard model should be used.

58. Australia has created a model for the fundamental inputs to capability - Defence describe FIC as 'those inputs that are necessarily combined to achieve capability.' The US

uses a different model, and the UK a different one again – but what is important is that these models are used consistently across the range of capabilities. Defence's current formal description of FIC suggests using them as a 'checklist' to ensure all considerations have been addressed – but this ignores the utility of FIC during design to properly understand the completeness of the capability (all elements and relationships working together).

59. Defence guidance also tends to treat each element of FIC separately and largely in isolation. Defence's summary of the FIC[x] are:

a. **Organisation** means that the capability is employed within flexible functional groupings with an appropriate balance of competency, structure, and command and control to meet the endorsed capability requirements stemming from the original need.

b. **Command and Management** includes effective command and management arrangements at all levels to safely and effectively employ the capability, including its integration across Defence.

c. **Personnel** means the role of a competent workforce component, including ADF (permanent and Reserves), APS and contractors, in the delivery, operation, sustainment and disposal of the capability.

d. **Collective Training** means that the capability is supported by a defined collective training regime to a validated performance level against the Defence planning requirements and based on the original need.

e. **Major Systems** includes significant platforms, fleets of equipment and operating systems that enable the effective generation of Defence capabilities.

f. **Facilities and Training areas** means the infrastructure requirements necessary to support the delivery, sustainment and operation of a capability system, including training areas which may mean any area of land, sea, undersea or airspace that may be designated for military manoeuvres or simulated wartime operations.

g. **Supplies** include managing all classes of supply to maintain a capability at the designated readiness state, including sustainment funding and fleet management.

h. **Support** includes engineering support, maintenance support, supply support, training support, packaging handling, storage and transportation, facilities, support and test equipment, personnel and technical data and computer support.

i. **Industry** includes the consideration of the resilience and capacity of industry, such as the reliability and health of supply chains.

j. **Data** includes the data created, gathered, used and reused by a capability, including the capacity to integrate, secure and share data across multiple major systems and capabilities.

Figure 9: Probability cloud with multiple elements

60. For those of us that like definitions, we can immediately see that the descriptions above are very open to interpretation. Most of them do not effectively describe the "what and "why" of the FIC elements, but reword the title in a generic fashion. A key example is 'Support' which simply lists type of support.

61. The current description of FIC works well in high-level conversations but does not help in achieving a **consistent** systems engineering approach. And the FIC construct is used throughout the life of a capability for systems engineering purposes. To achieve this a deeper level of thought is required. In this paper, an architectural approach is taken, consistent with systems engineering[xi].

62. Architecturally speaking:

a. *Organisation* is a framework of **roles** and their relationships. Only when roles are filled by actors can an organisation be effective.

b. *Command and Management* represents the governance **processes**, decisions and **rules** or policies that govern the effective employment of the capability.

c. *Personnel* are tangible **resources** that are further divided into classes. Key to this discussion is the workforce that operate the *Major Systems*.

d. *Collective Training* are **processes** specific to a validated performance level.

e. *Major Systems* are **resources** that are managed assets. These are normally Supply Class VII items.

f. *Facilities and Training areas* are **resources**, more specifically the same type of resources as *Major Systems* (managed assets). Some facilities are necessary to house major systems in order for those major systems to be used to achieve an effect. An example here is a ship (as a facility) that provides 'hotel services' to a weapons system.

g. *Supplies* are **resources**, as defined by the classes of supply with the exception of Supply Class VII (*Major Systems*).

h. *Support* describes **processes** (engineering; maintenance; the act of supply; training; packaging handling, storage and transportation; etc.).

i. *Industry* describes the **states** of Industry. States, and the change of states are described architecturally through **effects**.

j. *Data* can be **resources** for consumption that should be managed, This was the subject of a previous white paper, noting the similarity with *Supplies*.

63. Resources are the only tangible aspect within FIC. Organisations and roles are empty constructs that only become viable if actors (personnel) are assigned to them. Major systems can only be used if personnel operate them[xii].

64. Processes are a glue concept. Processes are also empty constructs that only become viable when the described roles are filled with actors and the required resources are provided.

65. The architectural approach with the required relationships between the various elements creates a complex picture. But this is needed for understanding how likely a capability is going to be effective in a given context.

Figure 10: Capability cloud with direct influences indicated

66. The overall effectiveness of a capability to achieve the desired effects can be calculated through the effectiveness of the relevant FIC. Processes are only as good as the ability to resource them. Organisations are only as good as the ability to assign workforce to them. When viewed through the architecture lens, these relationships become clear.

[ix] This definition originally taken from Capstone Doctrine ADDP 00.2 – Command and Control.
[x] A full definition of the original eight FIC was in ADDP 00.2, and the summarised definitions were in the 'Capability Life Cycle Detailed Design'. These definitions are taken from the One Defence Capability System Manual version 2.0, which are unchanged from my 2020 white paper with the exception of the addition of 'Data'.
[xi] A system is a combination of interacting elements organized to achieve one or more stated purposes (ISO/IEC 15288-2015, Systems and Software Engineering—System Life Cycle Processes, 2015). At a base level, an architecture describes elements and their relationships – architecture and systems engineering are symbiotic activities.
[xii] The complex and nuanced discussion around automated systems as actors is outside the scope of this white paper. The upshot of that discussion is that personnel are still required in the operating chain.

Larger versions of selected images

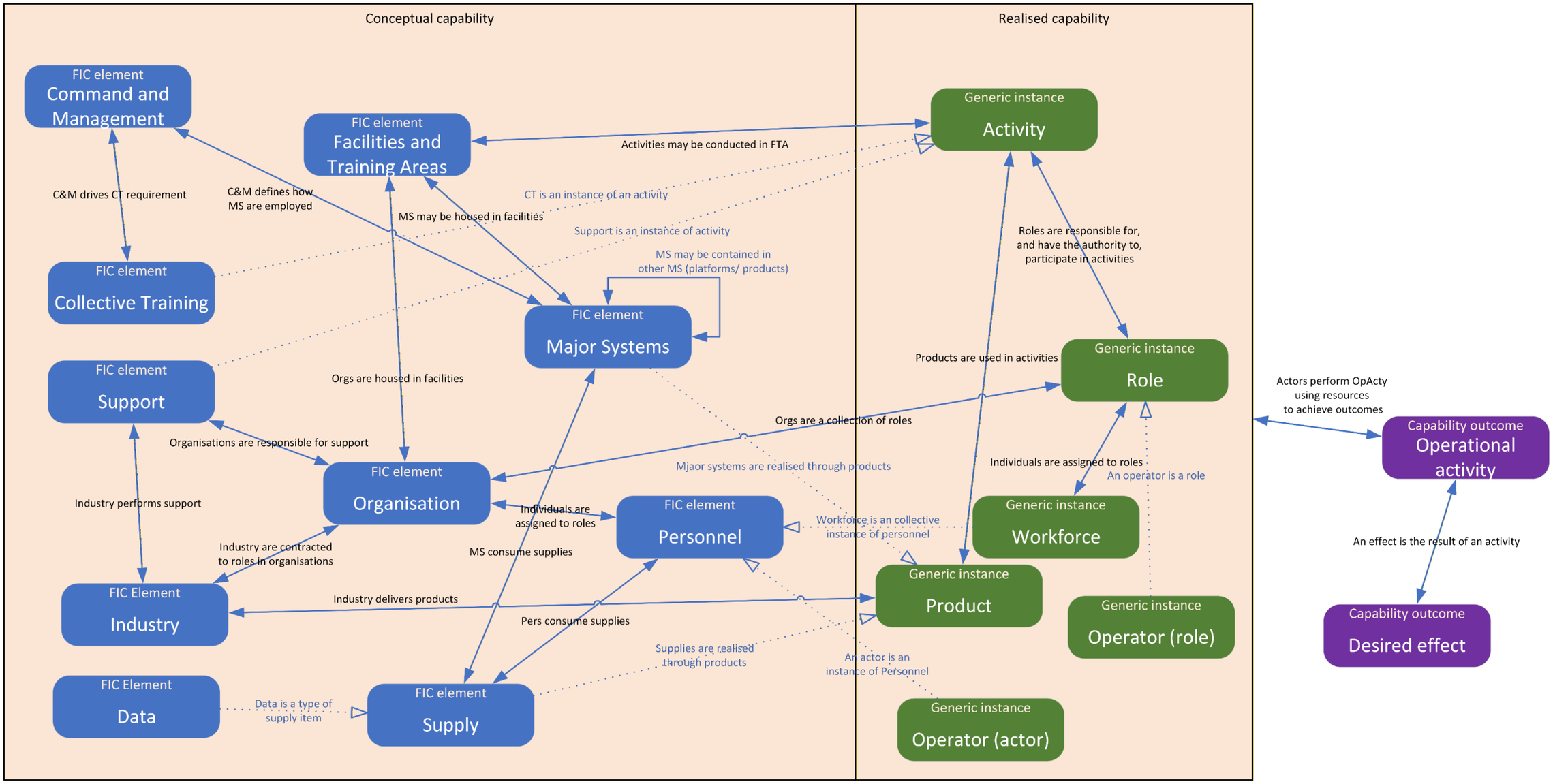


Figure 11: Larger version of Figure 1: FIC relationships

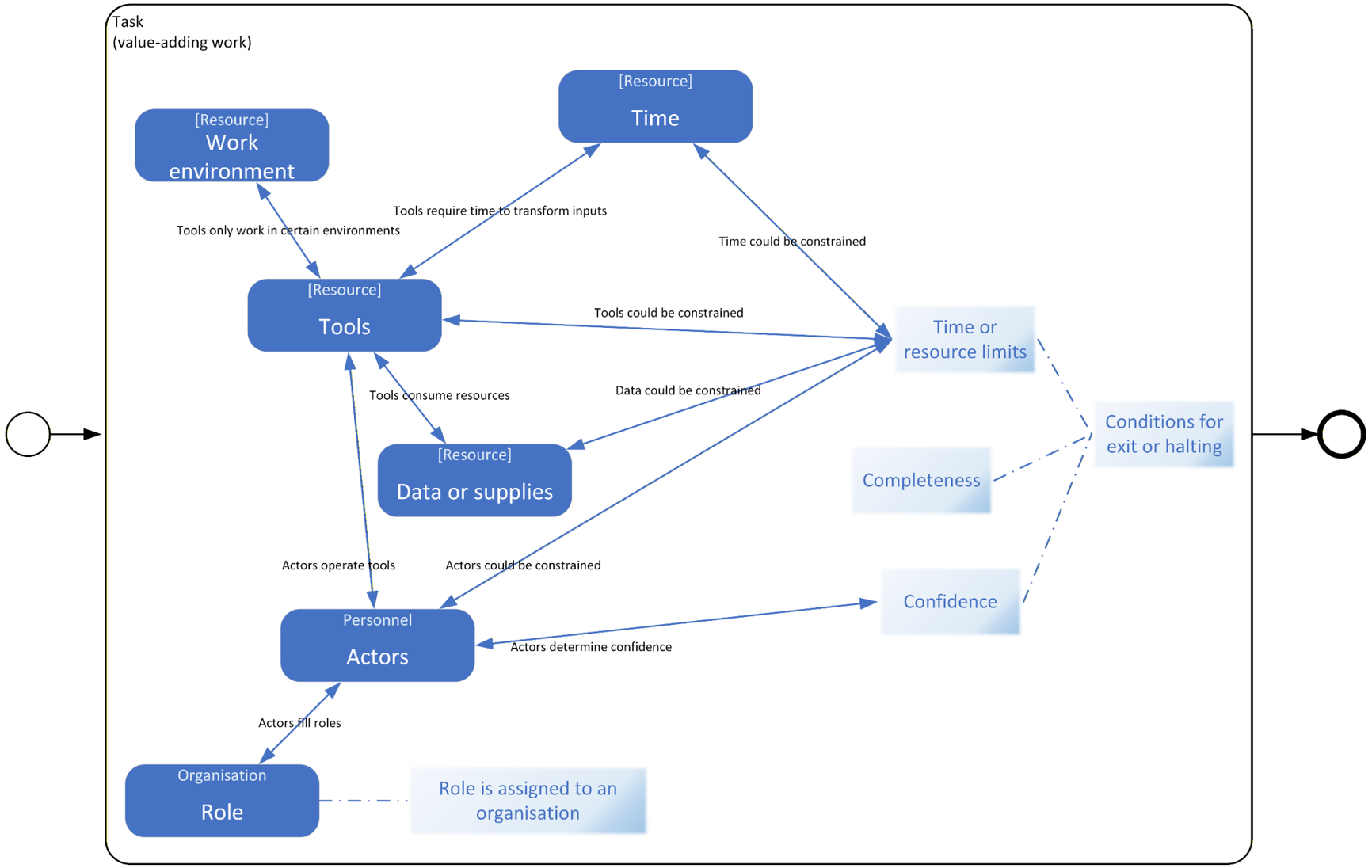


Figure 12: Larger version of Figure 3: Internal perspective on task factors

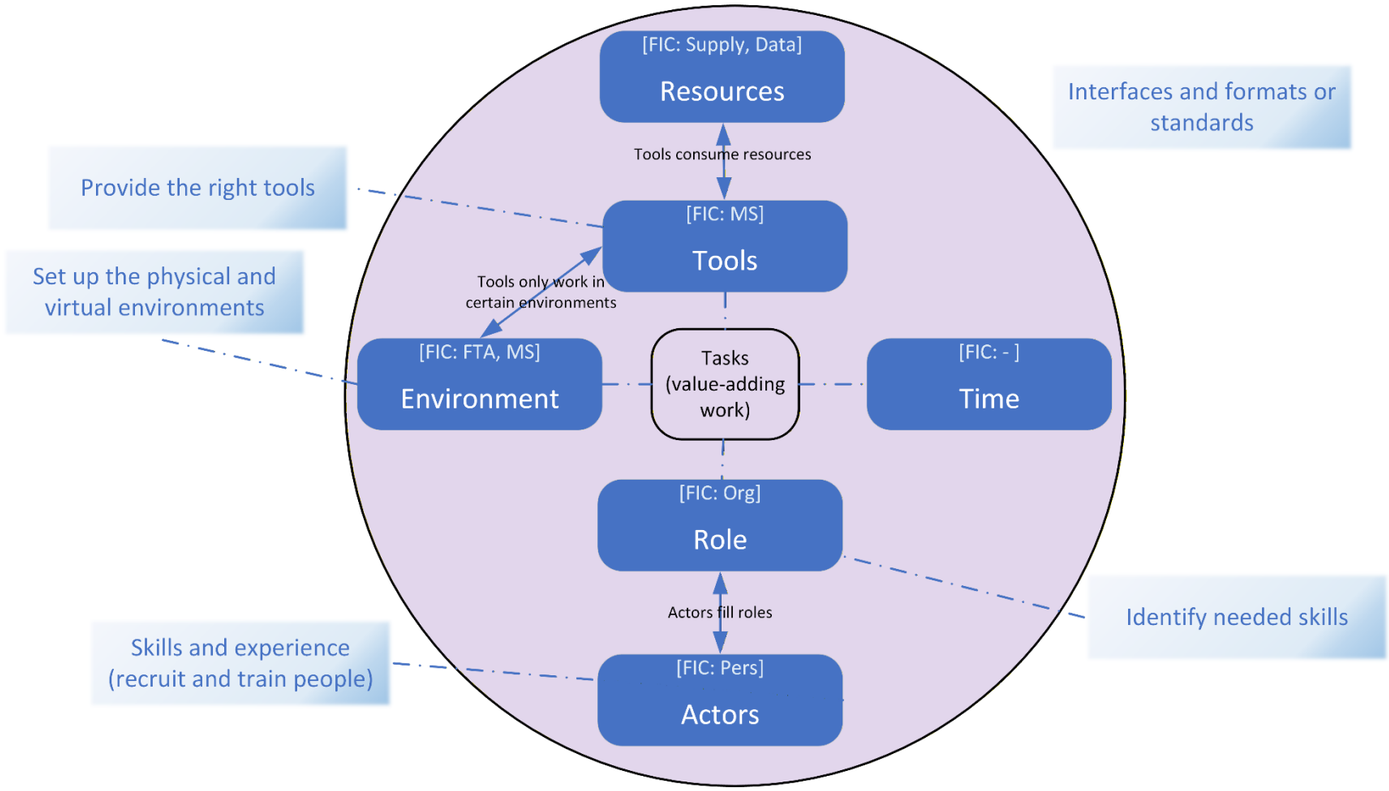


Figure 13: Larger version of Figure 4: Relationships between the fundamental inputs to process