A FOCUSED APPROACH TO BUSINESS CAPABILITY

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Abstract: The term 'business capability' is widely used and generally understood, but definitions vary greatly and are often insufficiently detailed to avoid confusion. Business processes are often mistakenly seen directly as a capability without any specific detail that would differentiate such a capability or process in a similar competitive firm or business. The increasing use of enterprise architecture approaches in consulting practice to analyse and make critical business change decisions such as business service divestment or outsourcing has resulted in the need to develop a more specific focused definition in order to differentiate between capabilities and their enabling resources. This paper seeks to create a focused and specific business capability definition that reduces confusion and enables clarity in defining capabilities within an enterprise. The approach reviews and categorises existing definitions, identifying four key elements of capability that are then analysed using resource based theory and operations theory to produce an integrated definition. The paper proposes an operational definition of resource capability relating to driving and passive resources. A structured tabulation is proposed that enables specific capabilities to be defined in terms of a delivery process, tangible and intangible resources used or consumed and the specific value added by the capability.

1 INTRODUCTION

The concept of capability is increasingly important due to the focus on enterprise architecture and the way a business serves its customers. Despite the wide use of the term, there are large differences in definitions (Curtis et al, 1995) based on their origins in business strategy, operations management and IS and service oriented architecture. Capability is often used to describe the generic potential ability of a business or parts of a business. There is an intuitive view of what capability may mean, but little work has been done to qualify and compare specific capabilities despite their use in analytical architecture frameworks. Students and practitioners often find it difficult to explicitly pin down and differentiate the key capabilities and services provided by a business. This can lead to problems in identifying different capabilities needed for strategic alignment when using enterprise and domain architecture tools (Liu et al, 2011). An explicit and measurable definition is necessary to make informed business decisions for people, systems and process change. For example when deciding whether to divest or outsource IT services that support specific business service capabilities (Liu et al, 2011), or the

allocation of the correct resources such as in medical process pathways and patient safety (Ball et al, 2003). This paper analyses the variety of existing definitions of capability to identify key themes that characterise the term. Working from first principles and using these themes and two examples it proposes more specific definitions to support architectural frameworks. The work is in the process of being tested with an industrial collaborator (for potential inclusion in EA analysis) and is also part of a current research project into the impact of capabilities and patient safety with a major hospital.

2 CAPABILITY DEFINITIONS

2.1 Business Strategy

There has been a focus on organisational aspects of capability as part of the research into business strategy to support the idea of core competences advanced by Porter (Porter and Millar, 1991) and Prahalad and Hamel (Prahalad and Hamel, 1990). This is based on the resource based view of the firm that sustainable competitive advantage is a result of the specific grouping and use of resources (Penrose,

Ref C:	Definition of Capability	Key Factors	Key Component	Source
1	*what a business function does and what its externally visible behaviour is*	what a function does and its behaviour	Capability is related to work functions and behaviour	Homann, 2006
2	*its fundamental purpose in terms of the outcomes of the activity*	purpose, outcome, activity	Capability relates to activity outcomes	Merrifield et al, 2008
3	*a firm's capacity to deploy Resources, usually in combination, using organizational processes, to effect a desired end.*	capacity to deploy resources using organisational processes	Capability is a capacity to use resources	Makadok, 2001
4	*operations strategy involves exploiting capabilities of operations resources'*	exploiting resources capabilities	Capabilities are functions of resources	Slack et al, 2004
5	*an organization's ability to assemble. Integrate, and deploy valued resources*	ability to assemble and integrate resources	Capability as an ability to do coordinate resources for action	Bharadwaj, 2000
6	*process capability describes the range of expected results that can be achieved by following a software process*	results of a process	Capability relates to the result of a process	Paul et al, 1993
7	*the ability that an organisation, person or systems possesses*	ability of a person or system	Capability depends on resource	Josey et al, 2009
8	*abilities within a firm which can be linked together as business processes in order to enable a specific purpose or outcome'*	abilities, process, outcome	Capability as ability related to the specific outcome of a business process	Beimborn et al, 2005
9	*capability is the capacity of a team of resources to perform some task or activity'*	capacity of resources to perform tasks	capability relates to groups of resources	Grant, 1991
10	*capabilities are 'formed through the coordination and integration of activities and processes*	coordination of activities and processes	capabilities depend on process integration/coordination	Hafeez et al, 2002

Figure 1: Content Comparison of Capability Definitions.

1959); (Wernerfelt, 1984). For example Grant's theory of organisational capability focused on how integration of specialist knowledge aids capability as a process input (Grant, 1991).

The resource based theory of competitive advantage suggests 'capability is the capacity of a team of resources to perform some task or activity'. Bharadwaj sees capabilities similarly referring to the assembly, integration and deployment of valued resources providing competitive advantage (Bharadwaj, A. S. 2000). A more explicit definition is provided by Makadok who describes a business capability in terms of a 'capacity to deploy resources in combination with processes. (Makadok R. 2001.). These definitions critically imply that the use of resources in a particular way is fundamental to the concept of capability. Other authors refer to capabilities of a firm and their importance in adding value and value creation. For example Moller et al (Moller and Torronnen, 2003) develop a capability profile for suppliers, but don't specifically define what capability is. Gallouj et al (Gallouj and Weinstein, 1997) in their paper on innovation in services see capability in terms of competences bought to bear or mobilised by a service provider. They represent competences as a vector set and are careful to focus on teams or individual competences and exclude organisational competences. Nelson and Winter cited in Gallouj and Weinstein 1997, see competences as skills and intangible technical characteristics referred to codified routines and includes knowledge, knowhow and technical

characteristics which refer to methods and selection tests. This reminds us that competences include the intangible, but it misses the fact that capability and what we see as a subset; human and related competences are a function of resources, all resources and their organisation and application. Hafeez et al (Hafeez et al 2002) point out the relationship between core competence and capability and the fact that capability is formed by the integration of resources. They further suggest capabilities result from integration of activities, highlighting an important and intuitive linkage between resources and actions in a process.

2.2 Operations and Informatics

A second area to refer to capability is operations management theory, where capability and service are associated with of operational performance. For example Slack et al suggest 'operations strategy involves exploiting capabilities of operations resources' (Slack et al, 2004). This view further advocates capabilities as a function of a firm's resources. Capability is also used in informatics web and service orientated architecture. TOGAF makes an attempt to define capability as 'the ability that an organisation, person or systems possesses'. This reminds us that business structures possess capability (Josey et al, 2009). Merrifield (Merrifield et al, 2008) sees capability relating to the purpose of business activity and its outcomes. Beimborn (Beimborn et al, 2005) regards capabilities relating

to repeatable actions citing Wade & Hulland where capabilities relate to assets capable of producing products for the market. They also suggest that capabilities can be linked to together as business processes to deliver a specific outcome. This usefully relates capabilities to the outcomes of actions via processes. However, it adds to confusion by implying processes can simply be labelled as capabilities such as 'pay employees' and 'ship products', without understanding that capabilities perhaps relate more to the character of the resources delivering capability via the processes and not just the sequence of action or recipe for the series of activities. Homann (Homann, 2006) also relates capabilities to process and suggests capability is a model of the behaviour of a business function. However, whilst intuitively reasonable, both Homann and Merrifield's approach (Merrifield et al, 2008) avoid mentioning or invoking the contributing resources and the often complex way they enable the capability. We can summarise the definitions of capability by comparing the semantic content in Figure 1.

3 CONTENT COMPARISON

3.1 Operations and Informatics

By comparing the content of these definitions from the summary table we can see that there are a number of key themes we can explore to better define capability. Firstly capabilities relate to work processes and the outcome of the work process (C1) (C2) (C6) (C8) (C9). We can also identify that capabilities relate to the capacity, promise or potential to do something (C3) (C5) and also to a specific outcome, value or result of an activity (C2) (C6) (C8).Finally capability is a characteristic of an organisation and specifically how it uses and applies its resources. However, an organisation is an organised collection of resources which themselves also provide the basis for value adding capability (C4) (C5) (C7) (C8) (C10). The four themes can be summarised as:

• Capabilities relate to work activities

• Resources possess capability

• Capabilities are the potential for action

• Capabilities relate to outcome/value.

We will now analyse these themes using two relatively easy to understand practical examples.

3.2 Capabilities and Activities

The traditional input-process-output model of business work activities sees business work activities as transformations of input resources via a transformation process or work activity into outputs (Slack et al, 2004). At the lowest level any work activity involves some kind of resource transformation. For example, reading a book transforms the reader's input knowledge from one level to another. Assembling an electronic device transforms the components into a new structure as part of a saleable product. Thus any work process (activity acting on inputs) transforms the value of the inputs and their state from one value to another.

The transformation process involves the transformation of input resources in terms of a change of state (eg tangible; such as melting or forming materials or intangible in the form of a change in the level of knowledge, or 1s and 0s in a computer program). These input resources may be utilised to transform the inputs eg a person and a tool. Alternatively some of the input resources may be consumed as part of the conversion process, for example the solder used in soldering an ipod electrical component as part of the business of producing ipods, or the ingredients used in the act of making a pie. We need to differentiate between resources that are utilised to make the transformation process work vs. resources that are consumed in the process of transformation. The transformation process transforms the business inputs into outputs that, via a sequence of activities or process, are valued by the customer (Strnadl, 2006). We can say that a business is capable of producing a) products and services or at a lower level b) functions and components and service features that support the value added in the products and services delivered to the end customer. Each transformation activity adds value that leads to a product of service that can be sold to the customer as the output of a business. A process is a sequence for action or a recipe for the right combination of work activities and procedures to realise the potential to produce saleable products and services. Using the Davenport definition (Davenport and Short, 1990)we define a process as: a structured and defined sequence of activities that transforms a set of inputs (of specific value) to produce a specific output (of a different value).At this stage it is also useful to remind ourselves that a process may be tangible (Pt), i.e. we can see the activities being performed in a production line, or in an intangible process (Pi), where the process, e.g. a lecture, may transform knowledge in student's

heads, without any obvious transformation being visible, i.e. a service process (Slack et al, 2004).

3.3 Resources and Capability

A resource has a capability for interaction with the environment to create value. One of the key characteristics of capabilities is that they are a property of an object or thing, i.e. a property of business resources as suggested by some of the definitions. We talk about people having capabilities, but we are also aware that objects have capabilities. We may consider a person in a particular role has a skill or capability to do something. For example an assembly worker has a capability to assemble an object based on their knowledge of the object, their training and the procedures and the skill to operate a machine or tool to assemble the components that form the object. However, it is not only the person that has the capability. If we consider the assembly of an ipod may involve soldering electronic components in place by means of a soldering iron. The soldering iron has a capability to melt specific materials, in this case solder, to attach the component to a circuit board. Unlike the person, the soldering iron needs the person to enable or execute its capability.

ICT technology also possesses capability. For example we can replace the person soldering the component with a dedicated programmable machine or robot. The difference here is that the soldering robot is capable of soldering with very limited human intervention; perhaps only turning on the machine and ensuring inputs and outputs. Also the components of intelligent products themselves, such as an ipod, may possess intelligent capability, for example the chipsets used in the phone are themselves capable of controlling devices. To efficiently manufacture an ipod, or most objects we may use intelligent agents (Russell and Norvig, 1995) that act on the environment in order to perform a transformation. These may be people or intelligent machines (robots, software etc) and are resources that configure and transform the consumable resources used within the process of production.

The capabilities these agents possess could be considered intelligent capabilities that involve the powerful ability to adjust their work actions to suit variations in the work conditions. Other resources, e.g. materials, and subassemblies are effectively passive and possess no intelligent capability. However, some are more or less capable than others. For example a component such as an on-off switch

is not intelligent, but has what we could call a potential or capability to turn the ipod on or off. This suggests that we should consider a hierarchy of resource capabilities to reflect the way that the resource possesses ability to impact the environment and the type of capability such as intelligent/passive and whether they are part of the process (utilised to make the transformation process happen) or are consumable resources to it.

	Resource Capability	
	Intelligent	Passive
Used	intelligent process agents (eg production line workers), intelligent machines (robots, fixed production lines, ICT systems)	tools (eg soldering iron), codified information (procedures, drawings etc)
Consumed	intelligent components (eg computer chips, memory - ICT components)	materials, subassemblies, mechanical components

Figure 2: Resource Capability & Use.

3.4 Resource Capability Types

We can separate capabilities into three types; capabilities of people, capabilities of 'intelligent' machines and capabilities of inanimate objects. However, there is a fundamental difference intelligent resources (people, intelligent machines) have an intrinsic capability to act on the environment themselves to transform and add value, whereas the passive resources only add value when they are used by an intelligent agent. Very often these intelligent resources actively drive the process and coordinate the value added transformation. We can call these driving resources of the process. Driving resources use other resources, such as tools and machines and passive resources such as materials to achieve the transformation:

• Agent resources have a potential for interaction with the environment to create value

• Driving resources (people agents, intelligent agents) orchestrate and trigger the transformation process

• Passive resources require agents to realise their capability.

A person (human agent) or an intelligent agent e.g. a machine such as a robot or application is an agent resource of the business that will trigger and drive the process. For example a web bot may search, collect and group search terms (information resource) and return them as part of its search capability. An autonomous production line may act

as a driving agent to utilise tool resources (e.g. soldering tip) to solder and manipulate ipod components (passive resources). We should also think of capability as not just a property of individual resources, but of organised and structured groups of resources assembled in a process or a functional business group and ultimately as part of a whole business as per definitions C3, C5, C7.
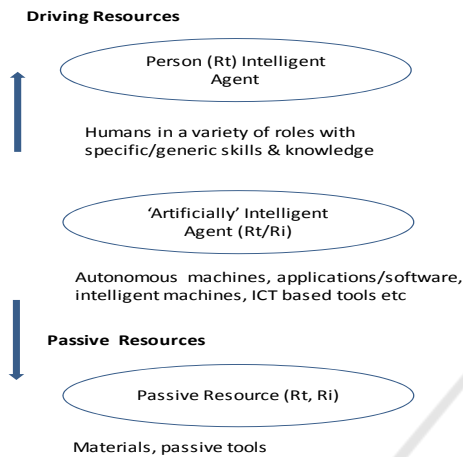

Figure 3: Driving & Passive Resources.

We can then relate capabilities to the basic resources of the firm. This approach allows us to identify core capabilities that ultimately relate to core competences of the firm as a whole and key capabilities relating to a specific functional group, as per the capability pyramid Figure 4.
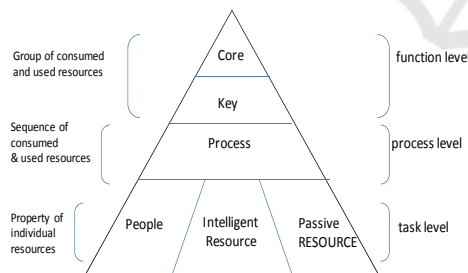

Figure 4: Business Resource Capabilities.

3.5 Tangible and Intangible Resources

Resources can also be tangible or intangible (Slack et al, 2004). For example the implicit knowledge in an employee's head, e.g. a doctor is intangible, but critical in performing useful work activities, such as diagnosing an illness and providing capability based on the resource based theory of the firm Beimborn (Beimborn et al, 2005). For example one assembly worker may be capable of assembling ipods faster than others because of their better knowledge and

experience or by using the standard tools in superior ways. Similarly intellectual property such as a patent provides a unique license to use specific knowledge and prevent other businesses from using it in the same way.

Figure 5: Tangible/Intangible Resources.

The properties of tangible and intangible resources can be summarised in Figure 5.

3.6 Capabilities as Potential

The confusion of capabilities with processes is reasonable if we think of a capability as the potential for action is to create a transformation to produce a tangible or intangible output. We can say: A capability can only be realised by an action on an environment.

The capability needs to be realised by a work activity or sequence of actions/process that delivers the capability. In other words a capability requires a process to define its potential for action. We can therefore name capabilities using a verb for example a production line has a capability to manufacture, a person in the role/with the skills of a design engineer has the capability to design. A pizza delivery agent, with the right resources (address and price information, pizza, moped etc.) has the capability to deliver. Capabilities are realised by interaction with other resources and are inextricably linked to process.

3.7 Capabilities and Value

Another important factor is that capabilities must provide the ability to deliver an outcome or a change

Activity	Take order	Make dough	Form pie base & ingredients	Cook Pie	Serve pie	Transact bill
Value	V0	V1	V2	V3	V4	V4
Driving Resource	**Waiter**	**Pastry Chef**	**Master Chef**	**Cook**	**Waiter**	**Front of house**
Capability	To manage customer needs, take and enter order details	To make pastry	To assemble pie, To manage catering resources	To cook pie	To serve order and provide bill	To transact bill
Process	greet customer, take order, pass order to chef	place ingredients in dough machine, set machine controls, start and stop	collect, cut and shape pastry case, select and add ingredients	place raw pie in oven, set oven controls, remove cooked pie	serve pie, calculate bill	transact bill, receive payment
Output	pie order for table n	mixed dough	uncooked pie	cooked pie	served pie, billed order	paid bill
Utilised resource	ordering system	pastry mixer	pastry cutter, knife	oven	ordering system	Electronic till
Capability	store order, calculate price, display order	make pastry	shape ingredients	cook pie	display and print bill	display bill, calculate change
	link to electronic till					
Consumable resource	paper	flour, water	raw pie ingredients	electricity	pie	electricity, till roll

Figure 6: Capability Example.

adding value to the business/customer. Each internal activity or sub-process creates added value, which like the parts of a product are assembled and sum to a final value add. This value add must be sufficient for a customer to be willing to pay the price for it. We can illustrate the interaction of resource capabilities to add value by using an intuitive example of a restaurant that specialises in producing hand made pies. It has this capability as a result of specific capabilities of the restaurant staff and the resources they employ in the restaurant processes. Each capability transforms a consumable resource or utilises a resource to add value that the customer will pay for in the food and service they receive. Let us suppose the master chef has unique skills that enable him to design and skilfully make a unique range of pies that draws customers to the restaurant. The restaurant has the capability to make unique pies to order due to the capability of the master chef who organises other agent resources such as the pastry chef and the cook to work with him to make the pastry and cook the pies. This integrated capability of the restaurant may also provide it with a competitive advantage. However the capability also requires the use of utilised resources such as pastry mixers, ovens etc. and passive resources such as kitchen utensils, each with their own capability that contributes to the overall capability. In additional intelligent information processing resources such as the electronic ordering system and till are part of the capability. We also must not forget the consumable resources transformed by the driving resources as part of the process delivering the capability. For example pastry is created from flour eggs and water and shaped. Meat, vegetables and seasonings are cut/mixed and placed in the pie. Each activity has

used a capability of a driving resource to transform the consumed resources, or organise another resource to add value. But, we have only considered part of the mechanism that delivers the capability. The pies have to be served to the diners and the diners have to be managed and billed. This requires the coordination of other driving resources such as a waiter and front of house roles that deliver the pies and the bill to the customer and complete the business transaction by ensuring the customer's payment that pays for the value adding capabilities.

3.8 An Integrated Definition

From the previous sections we can see that a capability:

- Is possessed by a resource or resource groups of resources (tangible Rt and intangible Ri)
- Is the potential for action via a process P
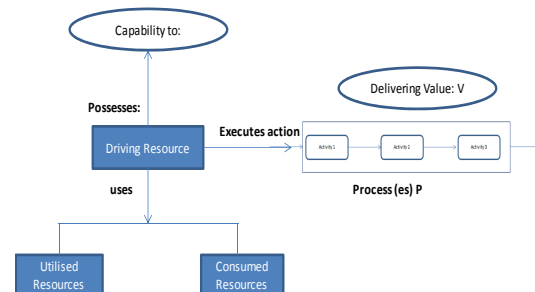- Produces a value for a customer V (internal/external)

Figure 7: Capability Components.

Realising the capability requires interaction with the environment and the use of other resources: A capability is the potential of a business resource (or groups of resources) to produce customer value by acting on their environment via a process (P) using other tangible (Rt) and intangible Resources (Ri).
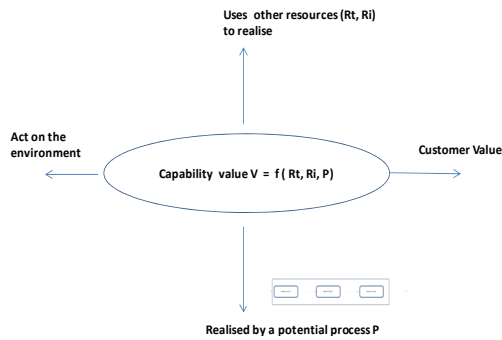

Figure 8: Capability Characteristics.

This definition allows us to account for the fact that individual resources possess active and passive capability as well as the organisation of groups of resources as in an organised business function and ultimately the complete business. Business or organisational capability refers to the collective capability or a group of resources with potential to deliver a specific business value output to an external customer. This capability depends on the way the grouping for action is made eg in a process structure or team structure etc.

4 DISCUSSION

4.1 Capability vs. Process

Using the pie example we can define a formal structure to document the capability. Firstly the capability must be labelled using a verb/noun combination to semantically describe the potential it provides. In this case we might choose a capability at the key level (not just a single process) for example 'to provide customised pies to order' note the operational action elements: 'serve' and the deliverable: 'pie' and the form in which it is provided 'to order'. The semantic choices in the statement if chosen wisely will provide much specific evidence about the capability. For example the choice of 'to serve' vs. 'to provide', implies that the pies are not merely made available as in an environment, but served in controlled conditions such as a restaurant.

Capability f(P, Rt, Ri) to: *action/deliverable/conditions*		
Driving Resource: *process owner*		
Value: *related to customer need and business objectives and identifiable products/services*		
Process (P)	Tangible Resources (Rt)	Intangible Resources (Ri)
description from process architecture	*driving, passive, active*	

Capability f(P, Rt, Ri) to: serve customised pies to order		
Driving Resource: Maitre de		
Value: hand crafted country pies		
Process (P)	Tangible Resources (Rt)	Intangible Resources (Ri)
Pie Making	master chef, pastry chef, cook	knowledge of pies, cooking skills
Restaurant service	waiter	service skills
Billing	front of house, order system, till	knowledge of order value, simple mathematics

Figure 9: Capability Template/Example.

To enable this capability we need to include the driving resource responsible for the related process, in this case the Master Chef or Maitre de. The driving resource will need to consume and utilise other resources (tangible and intangible) within a process or series of processes to deliver the capability. The process names can be sourced from the business process architecture. The level of description of the tangible and intangible resources will depend on the capability level described (see Figure 4).

The other critical element is the value or benefit of the capability to enable use in evaluative decisions in enterprise architecture (Liu et al, 2011) and process engineering/reengineering decisions. For example, when deciding whether to develop a process or system or to divest it or whether to outsource etc.

This value is also critical for strategic decisions in understanding core competences as we discuss later. The value can be simply a statement of the benefit, in this example we may suggest a unique benefit, such as 'make to order pies' or 'hand crafted country pies'. However, we need to ensure the value relates to customer need and expectations and also to the business objectives. Ideally the value should be linked to identifiable products and services. This link will enable a meaningful inventory of capability to be established that can help a business understand how value is developed by combinations of different resources and processes. Numerical values can also be included using activity based costing analysis or a similar approach to define the monetary value of this capability for the business.

4.2 Internal and External Capability

We need to consider two types of capability to sup-

port the idea that the value produced by the capability may be internal to the business or external and to the customer as well as the business. External customer focused capabilities occur where the potential output is of core importance to customer benefit. This relates to Merrifield's and Porter's definition relating capability to fundamental business success and customer value. In contrast an internal business capability is where the potential output is delivered within the business ie to help run the business and plays no part in adding customer specific value. This relates to Beimborn's (Beimborn et al, 2005) view about capability being 'what a business function does'.

4.3 Generic vs. Specific Capabilities

Driving resources using different combinations of activities and resources will produce variations in the realisation of the capability. For this reason we need to consider generic capabilities eg to manufacture something vs. the specific capabilities to manufacture a specific item such as an ipod, or a computer chip that is a component of the ipod in a dedicated and focused, reasonably invariant processes. We should also consider that some capabilities depend more on the linkage and coordination of resources than on a specific resources. Many capabilities reside in a purposely integrated group of people, process and technology and the way they are ingeniously organised and architected by the business. Hence capabilities may vary and actually disappear over time. This alludes to the organisational capability mentioned by some authors, i.e. the ability to coordinate disparate resource capabilities to produce a greater capability for the business is a key capability in itself.

4.4 Capabilities and Competences

Competences are abilities of a company to add value (customer benefit) to their products and services. (Prahalad and Hamel, 1990) As Gadrey (Gadrey, 2000) suggests 'competences are a network of capabilities' and not a single process Competences are usually referred to in very generic terms such as the ability to do x or manufacture y, which makes use of the intelligent and wide ranging grouping of the capability of the driving resources and the intelligent machine resources as well as passive resources. As these authors mention core competences are seen as the cross functional integration and coordination of capabilities ie core capabilities support core competences. Core

competences are delivered by core capabilities. Defining capabilities as core or non-core in terms of being critical for the customer value add, embedded and unique (Prahalad and Hamel, 1990) enables us to understand at the resource level how the core competences of a business are developed and supported. The more the competence is interconnected, ie integrated, into a business structure the better you can retain control of it and the more sustainable it is. By definition then the more a resource capability or a group of core resource capabilities are integrated the greater the core competence. By definition you will not therefore be able to outsource it (ie find source another business that has the capability and can do it more cheaply/effectively) unless you give the core capability away to another business.

5 SUMMARY

We have analysed a range of definitions of capability from economics, business strategy, operations management and informatics and employed practical examples to develop a definition of a capability to include specific and potentially measurable elements; the potential of a business resource (or groups of resources) to produce customer value by acting on their environment via a process (P) using other tangible (Rt) and intangible Resources (Ri). We have shown that some resources may be intelligent or passive agents in a business process and that agents or driving resources use other active or passive resources to execute transformation activities that add business value.

The elements of the proposed concept can be included in an architecture model and have the following characteristics:

• Capability verb/noun definition forces specificity and clarity

• The output value of the capability is defined and could be enumerated and linked to economic information (finance architecture)

• Capability is linked to a named process (from enterprise architecture)

• Capability is linked to both driving and other resources that are critical to enable and ensure the quality of the output.

This approach enables a more structured definition of capabilities of an enterprise and its resources and a format to compare them at a variety of levels. It reduces confusion over meaning and enables different capabilities to be objectively assessed for

use in strategic and operational business decisions such as outsourcing and divestment selection and resourcing and creation of new processes such as in new product development or reengineering.

Further field research with industrial partners is planned to further test and develop the structure and analyse the semantic formulation of the capability description and its meanings. Opportunities to test the approach in other area are being taken up. A doctor or clinician needs to provide or source the right capability at the right time to ensure patient safety. Additional research in the medical patient safety arena (Rosenorn-Lanng et al, 2011) aims to investigate the link between this form of capability structure and resourcing to improve patient safety.

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