A Framework for Cross Disciplinary Efforts in Services Research

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Abstract
Interdisciplinary Services research programmes commonly entail an integrative goal, that is, to integrate theory & findings from the multiple disciplines involved. Services research has been frequently described as existing in silos, but little has been put forwards towards remedying this. This paper presents a framework for systematically relating different kinds of Services research by offering a set of sensitising concepts.

Working from the view that services are consistently defined as activities, rather than objects or artefacts the concepts of the framework are drawn from Activity Modelling approaches, such as Task Analysis, Domain & Process modelling, & Soft Systems Methodology.

Keywords:
Services, Activities, Interdisciplinary / Integrative Research

1 INTRODUCTION

Interdisciplinary Services research programmes commonly entail an integrative goal, − that is − to systematically integrate theory & findings from the multiple disciplines such as Management (e.g. Services Operations & Marketing, Organisational structures & transitions); Design, Manufacturing, Arts & Computing (User-Centred Design, Software as Service, & Services-Oriented Architectures) based disciplines.

Services research has been frequently described as existing in silos [e.g., 1-3], but little has been put forward towards remedying this, beyond exhortations to work together. This paper presents a framework for systematically relating different kinds of Services research by offering a set of concepts & answers a frequent call within services discussion [e.g., 2, 3].

Working from the view that services are consistently defined as activities − rather than objects or artefacts − the concepts of the framework are drawn from Activity Modelling approaches, such as Task Analysis [4], Domain [5] & Process modelling [6], & Soft Systems Methodology [SSM, 7]. Ironically despite multiple assertions that services are activities, very little work has taken such an activity perspective on services [for exceptions see 8, 9].

By embracing elements such as: domain, value, values, actants, activities, goals, & environment; the elements of the framework can relate to a number of pertinent streams of Services research. This includes the IHIP debate in Marketing, the Service Dominant Logic (SDL), PSS, Functional Products, Design 'Philosophies' of Services, & technologies such as HUMS & SOA. This provides a set of concepts with which to *relate systematically* research themes & disciplines within interdisciplinary projects. This should help to enable building common ground between disciplines & researchers.

1.1 Paper Overview

Section 2 discusses pockets of services research. Section 3 discusses the nature of Integrative research. Section 4 presents an overview of the Activity Based Framework for Services (ABFS). Section 5 relates several strands of Services research to the framework's elements, we include The IHIP characteristics; Service Blueprinting; the Service-Dominant Logic; & Product-Service Systems. Section 6 concludes the paper.

2 POCKETS OF SERVICE RESEARCH

It is difficult to trace the growth in services because of differences in the ways that they are defined & reported over time & between nations. However, a figure that is often cited is that services account for 70-80% of Western economic activity. During recent years, a number of monikers have been put forwards for a shift to service as the focus of economic activity: *Functional Economy*; *Servitization*; *Service systems*; & the *Service-Dominant Logic*. The term *Services* embraces a number of different forms & contexts; from services that are intangible, heterogeneous, perishable, with a production process that is inseparable from use or consumption; via services on people such as medicine & education; through to maintenance procedures on hardware. A 'radical' position has emerged in the Service-Dominant Logic [10], where all marketable offerings, whether classed as goods or services, provide an element of *service*. Although this has been heavily contested & debated.

For many years *Services Marketing*, taking its lead from earlier work in Economics, held that a number of 'characteristics' were enough to distinguish clearly products from services, namely **I**ntangibility, **H**eterogeneity, **I**nseparability, & **P**erishability (IHIP). The IHIP characteristics partially enabled services marketing to 'break away' from mainstream marketing & fuelled a number of research streams. These included the refinement & debate of these 'service defining characteristics;' as well as other issues concerning the

effective marketing & execution of services (e.g. service quality, customer relationship management, measures of service quality, & human aspects of service execution). Several papers [11-13] have questioned IHIP as a foundation for Services Marketing. Some suggest refinements [14, 15] others alternative paradigms / logics such as Nonownership [12] or the Service-Dominant logic [10]. Despite this quite deep questioning papers are citing the IHIP characteristics as the *key* elements of service [e.g., 16-18], as opposed to four among *many* facets of relevance to Services?

Design, Engineering & Manufacturing have also taken notice of the shift to a service economy. In the UK research programs such as IPAS, KIM, & S4T focus around some aspect of Service. A number of approaches have emerged that explicitly tackle the Design of services, or the Co-Design of products & services [19-21]. The most prominent approaches are Product Service Systems (PSS) [21] & Functional Products [20]. There are also number of 'design philosophies' for innovative & effective services design processes [e.g., 19, 22].

In computing, the emergence of Service-Oriented Architectures [23] & the crossover of ideas between Services & User Centred Design [19, 24, 25] provide insights into: how to support modularity / reconfigurability in processes & technologies; & how to approach Design of Services in a meaningful, repeatable & user-centred manner.

We observe two relevant issues in services research: firstly, their activity based nature & secondly, the dispersion of relevant work in different fields.

The first observation is that the activity-based nature of services implies a difference to the 'tangible' nature of products. Many authors emphasise activities in their definitions. For example, Hill [26] notes that "*some change is brought about in the condition of some person or good, with the agreement of the person concerned or economic unit owning the good* [p.318]." Despite this, outside of Service Blueprinting, & Tomiyama's work [e.g., 9], the activity-based nature of Services has been neglected. However, since Service Blueprinting's introduction by Shostack [8], few links are made with the activity-oriented research undertaken in various communities (e.g., Task Analysis [4], Process Modelling [6], Soft Systems Methodology [7]). Service Blueprinting has no explicit notion of goal, actor, & role, & has a relatively simplistic approach to temporal issues in service processes. Tomiyama [9] asserts "*we still don't know, for instance, how to describe service goals, how to decompose the total goal into subgoals, how to find a service mechanism to achieve a subgoal* [p. 10]," seemingly unaware of work that considers these issues in depth [e.g., 4, 5, 27].

Secondly, Services research is dispersed amongst different communities. Chesbrough & Spohrer characterised the situation as "*subfields … emerging in siloed academic areas such as management, engineering, & computer science schools, but precious few attempts have been made to integrate them* [1, p. 36]." Disciplines involved in Services research appear to have their own dogma & mythology, & all too often end up with minimal interaction with other relevant areas. When they do, they take on work such as the IHIP characteristics that have been substantially critiqued. Laudable efforts such as the Emergence conference in 2006, & the IfM & IBM's Service Science Management & Engineering efforts [3], have still not engaged with key communities.

We need of course to consider what integration & disciplines are, & we briefly consider these issues in section 3.

3 BEYOND DISCIPLINES: INTEGRATIVE RESEARCH

Tress *et al*. [28] suggest three forms of cross-disciplinary research multi-, inter-, & trans-disciplinary. All three integrate across disciplines. Multi-disciplinary work uses a thematic umbrella to provide impetus to integration efforts; whilst inter- & trans-disciplinary programs make use of a common research goal. Transdisciplinary research is further distinguished from interdisciplinary work by the presence of non-academic participants in knowledge creation.

Szostak [29] notes that the closest synonym for Integration is *synthesis*. This needs to be more than appropriation of methods or knowledge from another discipline. Integration involves critical reflection about: the strengths & weaknesses of different disciplinary insights; & biases inherent either in disciplinary practice or more general academic practice. Overall, Integration involves finding common ground among the different disciplinary insights. Following Tress *et al*. [28] & Szostak's [29] definitions there are in effect, three kinds of synthesis around a theme, around a goal, & around a theme, goal & integration of knowledge for & from non-academic community members.

If integrative research aims to produce new knowledge by combining knowledge & experience from different disciplines, we need to consider what a discipline is. Long & Dowell [30] note that "*most definitions assume three primary characteristics of disciplines: knowledge; practice & a general problem* [p. 11] going onto to formally define a discipline as "*the use of* ***knowledge*** *to support* ***practices*** *seeking* ***solutions*** *to a* ***general problem*** *having a particular* ***scope*** [30, p. 12, emp. added]."

In Figure 1 we have two disciplines, each with their own general problem, scope knowledge, practices & solutions. Through combination, a new area can occur (e.g., Economic Psychology) & number of positive & negative outcomes can occur. These range from Appropriation, Cooperation (complementary goals), Collaboration (shared goals), through to negative interactions based around Lip Service, Misappropriation or Greedy reductionism [31]. Greedy reductionism is any form of misplaced reductionism. Whether this means boiling all things down to an inappropriate level, or assuming that all phenomena are instances of some other discipline (e.g., all sociology is psychology, all marketing is economics). Other issues are the varying disciplinary views on Pragmatism; & the distinction between producing exploitable research & being involved in the exploitation process [e.g., 7, 32].

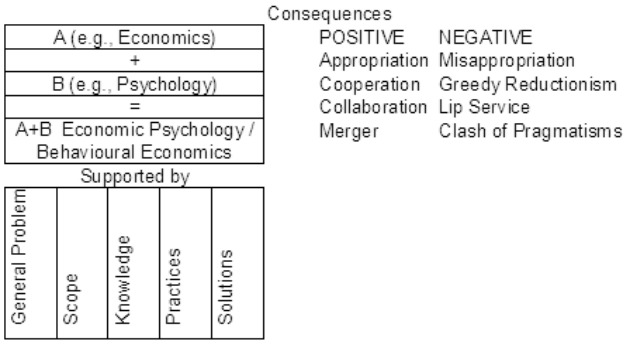

Figure 1: Illustration of the nature & some of pitfalls of Integration

When we consider how Integration relates to research projects & programmes, there is some prescriptive advice

for how to go about Integrative research [33, 34 35, 36]. These are generally manifest as a number of activities such as "*Resolving disciplinary conflicts by working toward a common vocabulary* [36]" or "*Integrating the individual pieces to determine a pattern of mutual relatedness & relevancy* [34]." One recurring piece of advice is to develop some form of framework to integrate different strands of the research. Such a framework anchors other integrative research activities, such as communication & glossary development; through to deeper consideration of ontological (what exists in the domain) & epistemological (how we know what we know about the domain) issues. The nature of such a framework is our next concern.

3.1 What is meant by a Framework?

A framework can be seen to be a general set of concepts for understanding a research area. It is not tightly organised enough to be a predictive theory. It aims to sketch out the general concepts of a field of enquiry & the possible relationships between them. In contrast, a theory is an intellectual structure that embodies enough detail to make a prediction about a domain. A model is the application of a theory to specific phenomena. An aim of theory is to be general across many phenomena. A theoretical approach would aim to generate a number of models to account for different instances of phenomenon.

The framework is aimed at general understanding & communication rather than being an unequivocal verified or validated description of the world. Rather than stating that Services *are* activities, we state that we *view* services as activities. At this stage in its development, the Framework is put forwards to think about the Services domain, not to be a full & complete ontology of Service Systems. We recognise that the boundaries between the entities of the framework are negotiated & open to change. Rather than being an absolute classification of elements of a Service System.

4 AN ACTIVITY FRAMEWORK FOR SERVICES

In this section, we sketch the Activity Based Framework for Services (ABFS) for the consideration of Services research across disciplines. As noted, the ABFS developed from the observation that Services are defined as activities. We use the term *activity* to refer to a number of approaches that take their concern with *action*, for example: Task Analysis [4], Process Modelling [6], Domain Modelling [5] & SSM [7].

The ABFS's elements are a composite from different activity-oriented approaches. There is no unified method whose modelling concepts match the ABFS's elements. Each activity modelling approach embodies differing *first-class* modelling concepts. In the introduction, we noted that services are activities not objects or artefacts. Most activity approaches consider some aspect of objects or artefacts. In the former case, the objects are acted upon or reacted to; in the latter as entities that support both mundane (e.g., pen & paper) & novel tasks (collaborative web based writing). In addition, as a service *system*, there is interdependence between different service elements. Goals, for example, are scoped to what can be done in the service domain activities achieve these goals.

Concepts within activity modelling such as task, roles, & domain-object represent much of interest & relevance to those wishing to relate different strands of Services. For example, the debate on the IHIP characteristics [12] & Intangibles [14] relate to domain concepts; the works on types & models of service activities relate to activity descriptions & goal models.

4.1 Overview of the ABFS

The ABFS is represented schematically in Figure 2. Service activities are assumed to be carried out within a Service System. The service system embraces the objects (both informational & physical); the goals & values held by various individual & collective Actants. *Service activities* are carried out by *people* & *artefacts* to affect the objects in a domain. A service system can be considered to have a variety of effectiveness measures, depending on the value (i.e., benefit) sought, & this is evaluated when the quality goals are balanced against the resource costs. A service system has an environment, which has social, cultural, political physical dimensions. Borrowing from Dowell & Long [5], we suggest that *actants* & *artefacts* have Structures & Behaviours. The costs of setting up & maintaining these structures & behaviours are evaluated in Service Effectiveness assessments.

4.2 The main components of the Framework

The following lists the main components of the Framework.

Service Domain

Is the 'world' whose possibilities & constraints are organised in relation to specific goals. Objects are the elemental constituents of a domain, such as heads, & hairstyles or engines & aeroplanes. Objects can be abstract / intangible (i.e. informational) or concrete / tangible (i.e. physical) & can emerge at different levels of analysis. Objects can also exist within *actants* & *artefacts*. In some contexts, a person's knowledge can be considered the domain, as can a collective agent's shared understanding. Domains such as the internet & 3D graphics exist almost solely within artefacts, though, on occasion, a physical representation can be made to paper & other such media.

Domains 'overlap' between different Service Systems, & could be conceptualised as subdomains or overlapping with other domains. Therefore, an Aeroengine can be a domain in itself or can be a subdomain for aeroplanes & pilots; which in turn are sub domains of air-traffic control activities / services.

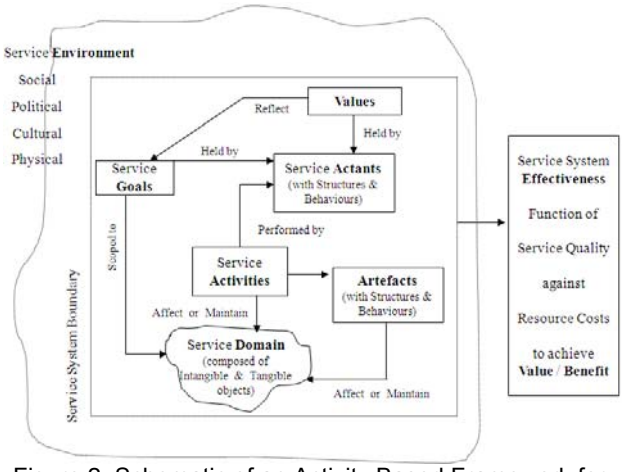

Figure 2: Schematic of an Activity Based Framework for Services

Service Goals

Are the specification of needed changes to service domain objects [5] & shape both the activities carried out & reflect *value*, *values*, & *effectiveness* measures. They are carried out by actants, & sophisticated artefacts but can only be 'held' by actants. Classically, they are represented hierarchically [4, 5], each goal mapping to a finer description of change or maintenance of a domain object. As service objects can be either concrete or

abstract, goals also vary in their concreteness or abstractness. Other work suggests that goals can be heterarchical [4], being embedded in a complex of higher- & lower-level goals [27]. Higher-level goals can reflect qualities such as those relating to user experience; or a general goal that applies to all activities, reflecting general values held towards the world (e.g., cost efficiency or minimisation of ecological-impact). There is a relationship between these higher-level goals & the value & expected values that actants have. Costs can be accounted for through financial measures, as well as others such as fatigue, social discord, or depletion of natural resources.

Services Activities

The sequence & type of actions (physical / non physical) carried out in order to achieve goals. Activities are concerned with changing (education, surgery, technology, upgrades) or maintaining (preventative healthcare, hardware maintenance) the states of *service domain object* attributes [5], when they are carried out they should achieve all, or part of, a *service goal*.

There are multiple classifications of service activities focussing around organisational division [37]; Economic Relationships [14, 26, 38]; the relationship to a product [39] or a more 'general' consideration of their nature [40, 41].

Service Actants (Individual & Collective)

Actants [see 42] are those entities capable of carrying out activities & the term covers people, & groups of people.

Work within services marketing has often stressed that service providers & consumers are inseparable [e.g., 43] leading some to argue that services are always co-created between service producer & consumer [10, 44]. However, this says little about the nature of those roles or the other actors acting as stakeholders in service performance. Nor does it allow us to consider the strength & weakness of co-creation on owned service domains, rather than personal domains. Typically, personal maintenance services (e.g., haircuts & surgery) need the co-location of the consumer & producer. Services on owned property often have less need for co-location, but require 'set up' activities in order to hand over the product to be serviced. Co-creation also says little about the role of *artefacts & technologies*. Whilst education has traditionally been co-located, technologies such as books, distance learning & teleconferencing can break the need for co-location, allowing development of knowledge in a non co-located asynchronous manner. The *service domain* remains the same (the learner's mind, knowledge, & skills); the means of changing it differ.

Another aspect of actants is their ownership relationship with other aspects of a Service System. Work within Services marketing has stated that services do not result in any change of ownership of an entity [45, 46]. This has been generalised in approaches such as the Service-Dominant logic & Nonownership paradigms. However, many services facilitate the movement & exchange of artefacts, there is danger in over generalising.

Service Artefacts & Technologies

Are the artefacts, tools, & technologies used to carry out services. Artefacts is a term that suggests both artificiality & making [47]. Artefacts are created entities that serve some purpose in activities; they rely on some form of technology for their creation. Because they are created for a purpose, rather than by random or natural processes, it is tempting to classify them according to a single purpose. Example purposes would include informational (e.g., books & databases); physical (e.g., tools such as spades & bulldozers); aesthetic (art); recreational (e.g., sports equipment); financial (bank accounts & credit cards). However, artefacts are multifaceted having a number of purposes. These purposes can be aligned or in competition with each other. They can also change over time. Archaeological artefacts may have had an original purpose, but after years in the ground or under the sea, serve to give insight into ancient life & culture. Even art works, viewed by many as serving a pure & aesthetic purpose can serve financial (investment), informational (propaganda), or nationalistic purposes.

Service Effectiveness

At this level of description, more traditional quality & effectiveness concerns would be expressed. Dowell & Long [5] see effectiveness as a function of task quality (the quality of a 'output' created by a Service System) & resource costs (the costs to participants of establishing structures & producing behaviours). Desired effectiveness is set by specifying desired task quality & the desired resource costs. Similarly, *actual* performance can be measured as a function of the *actual* task quality & the *actual* resource costs [5 p. 139]. Long & Dowell considered resources as being cognitive, conative, or affective, however, the notion generalises to other processes & entities such as organisational structure & responsiveness.

Service Values

Are the criteria with which judgements are made about other entities [7]. As such, they affect how actants view the effectiveness of a service system element (e.g., goal satisfaction, effectiveness). There is a tendency for some individuals & groups to see values as true & objective, those who do not share your values are classed as having none. Witness the view by many in environmental movement that short-term non-resource renewing profit driven enterprises have *no* values. Such enterprises have values, but they are focussed on judging things by profitability, capital liquidity, rather than sustainability. Values are key aspect of scoping the other elements of a Service System. So the form of the Service System can reflect the Values held by its actants. Whilst the goal of restaurants is to provide food & generate profit; the values held by the owners, staff & patrons can drive radically different manifestations of eating location, menu & experience. Comparing a high-class joint with a roadside catering outlet without reference to Value systems would be meaningless.

Service Environment

The environment often becomes a catch-all in activity-based approaches, covering all the things that are not first class entities in their modelling worldview. The reduction of impact on the environment has been a motivating factor in some Services research [21], & discussed as a side effect in others. It is important to formally represent not just the immediate environment of interest to services (i.e. the *service domain*), but the wider environment within which activities are carried out. Here we depart from the main theme of the paper, & find that activity approaches can benefit from environmental concepts within Services Research [e.g., 48].

Service Structures & Behaviours

Structures provide capabilities (e.g., knowledge, skills, information) in reference to a domain, whilst 'behaviours' are the activation of these structures to perform tasks. In Dowell & Long's [5] work, Structures & Behaviours applied to humans & computers. Human behaviours are considered purpose-driven; in contrast, artefacts are created to serve these purposes. Structures are physical (e.g., electronic, neural, bio-mechanical & physiological)

or abstract (e.g., software or cognitive or social schemes & processes). Behaviours may be physical, such as printing to paper or selecting a menu, or abstract, such as deciding which document to open, or problem solving. However, the concept can generalise to other aspects of a service system including the environment & thus we include social, cultural & physical Structures & Behaviours [48-50].

Other aspects of the ABFS

Relationships

Are numerous & not yet well enough explicated to make predictions. However, as general guide, key relationships are those between:

- goals & the actants who hold them;
- values & the actants who hold them;
- goals & domain objects;
- activities & the actants / artefacts that carry them out;
- effectiveness & the resource costs & quality measures;
- quality measures & values;
- actants & roles;
- actants & grouping of actants;
- objects & the activities that maintain & change them;
- values & the goals / activity structures that achieve or are influenced by them;

Boundaries

Are socio-technical [51], sometimes reflecting the physical composition of the world, at others times, decisions about an entities' scope. An example of the latter is boundary between the domain & artefacts & technologies. In some cases, the artefact may contain − in whole or part − the domain in question (e.g., 3D graphics or email). However, because a domain is enabled by an artefact does not mean it can be 'reduced' to the artefact. Film & television were in some way enabled by camera, television & projector technologies, but can now be viewed through computers, & the sophisticated nature of both home & cinema based systems blurs the distinctions between things. The notion of centrality of purpose may enable activity modellers to scope the roles of the domain & artefacts. Therefore, Engine Health monitoring technologies may help to support tasks beyond the main function of thrust, power & lift for an engine; even though they are embedded & considered in other perspectives as part of the engine.

Information & Knowledge

Information & Knowledge are explicitly represented through the specification of intangible domain objects [see 14] & implicitly specified through Structures & Behaviours [5]. In the case of the former, information & knowledge can be originals [14], that is additions to knowledge; or intangible products, that is, information-based products. In the latter case, information & knowledge about the operation of a domain can be formally represented as part of the domain, for example the message of a communication, or informally as part of the structures & behaviours of Service System actants.

5 ILLUSTRATION OF THE ABFS'S COVERAGE & USE

Within this section, we recount & compare the elements of the ABFS number of approaches with services research. Because of space restrictions, we will restrict our consideration to The IHIP paradigm; Service Blueprinting; the Service-Dominant Logic; & Product-Service Systems. One concern is to see whether the approaches can be classed as a framework for all Services Research, by considering the overall scope of their components against the ABFS.

5.1 The Service Dominant Logic

Vargo & Lusch [10] are concerned with providing a service-based worldview on Marketing & Economics. In this revised worldview, goods & services are subsumed in relation to the Service-Dominant Logic (SDL). Vargo & Lusch define service as "*the application of specialized competences (knowledge & skills), through deeds, processes, & performances for the benefit of another entity or the entity itself* [10, p.2]. Within the SDL value, rather than being *embedded* in goods / products by manufacturers, is *co-created* between supplier & consumer during service activities; although value is never explicitly defined in their work.

The SDL builds on two types of resources. *Operand resources*: are resources upon which an operation or act is performed to produce an effect, & in Vargo & Lusch's view, have been dominant in human history, that is the goods based view. *Operant resources*: are employed to act upon operand resources, & concern issues such as knowledge & skills. Noting that they are "*likely to be dynamic & infinite & not static … they enable humans to multiply the value of natural resources & to create additional operant resources* [p. 3]."

Operand & Operant mirror a common distinction between concrete & abstract entities & activities [5, 14, 40]. Operant resources are the province of the physical concrete aspects of the domain & environment. Whilst Operand map to the structures & behaviours or actants, or programmed / embodied in artefacts.

Activities	--
Goals	--
Actants	Considered as co-creators of value
Artefacts & Technologies	--
Domain	
Structures & Behaviours	Operand & Operant resources.
Effectiveness	--
Value	Undefined, despite using the term 122 times in their paper [10].
Values	--
Environment	--

Table 1:- Comparing the SDL against the elements of the ABFS

Compared against the ABFS, we can see that the SDL is limited in its scope as an organising framework for services research.

5.2 Service Blueprinting

In Services Marketing, the most refined approach to modelling service activities is Service Blueprinting [8] an approach that has evolved considerably since its introduction by Shostack. It has also become widely known outside of Services Marketing, having been applied in Design, Engineering, Healthcare, & Tourism. It would be fair to say that other approaches such as Servicescapes, Service Encounters, & Moments-of Truth owe a lot to Shostack's original work. Table 2 compares Service Blueprinting against the ABFS.

Activities	Explicitly represented
Goals	Implicit
Actants	Implied by lines of visibility
Artefacts & Technologies	Can be partially covered by tangibles
Domain	Can be partially covered by tangible
Structures & Behaviours	--
Effectiveness	Time-oriented
Value	--
Values	(Speed, cost)
Environment	--

Table 2:- Comparing Blueprinting against the elements of the ABFS

Shostack's work was motivated to identify & represent service functions; benefits; as well as standards & tolerances. One of the original strengths of Service Blueprinting was its focus on service as activities. Service Blueprinting has evolved since its introduction, embracing more lines of visbility, & an iterative cycle of development. However, the approach misses other elements of activity models, such as those outlined in section 3.

5.3 The IHIP Characteristics (and Debate)

Rathmell's [45] paper made several observations were made about services three of which were that Services are Imperishable, Intangible & having Imprecise standards. In combination with Inseparability, the observations evolved to be the four IHIP characteristics, that is, services are ***I**ntangible*, ***H**eterogeneous*, ***I**nseparable,* & ***P**erishable*. These have been defined as "***I**ntangibility− lacking the palpable or tactile quality of goods. **H**eterogeneity − the relative inability to standardize the output of services in comparison to goods. **I**nseparability of production & consumption − the simultaneous nature of service production & consumption compared with the sequential nature of production, purchase, & consumption that characterizes physical products. **P**erishability − the relative inability to inventory services as compared to goods* [13, p. 326].

A review by Zeithaml *et al.* [43] helped to solidify the perception that these four characteristics, define services & fully distinguish them from goods / products. Since then the IHIP characteristics have become widely cited as the key characteristics of services. Lovelock & Gummesson [12, p. 21-2] noted a textbook consensus about the IHIP characteristics arguing that they can be described as a paradigm for Services Marketing. The IHIP characteristics are often uncritically accepted outside services marketing as the defining features of Service [e.g., 16-18].

Hill's [14] concerns remain highly relevant. Hill [14] argued for a retention of a distinction between Services & Goods. However, the dyad needed refining into a triad, with Intangible goods being added to the Tangible goods. Hill notes that intangibles are 'Originals', "*additions to knowledge & new information of all kinds, & also new creations of an artistic or literary nature* [14, p.438]." Examples of Originals include books, music compositions, films, processes, plans, blueprints & computer programs.

Intangible goods generally need a physical manifestation. In an Economic context, they can be broken into Producer & Consumer durables. Some artefacts, such as software, act as one or the other in organisational or personal contexts. Combined with Lovelock's observation that Services can be focused, we gain a fourfold division, Intangible & Intangible goods, & tangibly & intangibly focussed services & activities. This demonstrates one set of relationships between Intangible & Intangible goods, & Tangible & Intangible focussed services & activities. Rather than misclassifying intangibles as services, a refined understanding is gained. Table 3 represents a 2 by 2 matrix of products & services that vary in their tangibility.

	Tangible Product	Intangible product
Tangible Service	Cleaning & upgrading memory (TS) MP3 player (TP)	Creation of (S) MP3 Music recording (Original represented as IP)
Intangible Service	Download (IS) of MP3 file to MP3 player (TP)	Support for finding & purchasing (IS) music (IP)

Table 3:- Matrix of Intangible products & services

The notion of a Service Domain relates most readily to goods, just as domains can be composed of a range of concrete (tangible) & abstract (intangible) products vary in their tangibility. By considering objects (and activities) as varying in concreteness or abstractness, we gain valuable insight into the debates on the properties of products & service.

Table 4 compares the refined understanding of the IHIP characteristics derived from synthesising the works of Hill [14], Lovelock [40] & others [43, 45, 52].

Activities	Explicitly represented by tangible & intangible activities [40].
Goals	--
Actants	Implied by inseparability [43]
Artefacts & Technologies	--
Domain	Explicitly represented as tangible & intangible domain objects [14]
Structures & Behaviours	--
Effectiveness	--
Value	--
Values	--
Environment	--

Table 4:- Comparing IHIP characteristics against the elements of the ABFS

5.4 Product-Service Systems (PSS)

The term PSS was coined by Goedkoop *et al.* [53] who defined a PSS as "*a marketable set of products & services capable of jointly fulfilling a user's need. The PS system is provided by either a single company or by an alliance of companies. It can enclose products (or just one) plus additional services. It can enclose a service plus an additional product. & product & service can be equally important for the function fulfilment* [p.18]." A number of papers have been keen to stress that PSS are combinations of numerous entities such as people, computers organisations, not just products & services. A key aspect of the approach is that a focus on development & exchange of Service − rather than products − is means of achieving greater sustainability. Table 5 compares the elements of the ABFS against PSS.

Activities	Some consideration of activity types [e.g. 39]
Goals	--
Actants	--
Artefacts & Technologies	Some
Domain	Implicitly through consideration of products
Structures & Behaviours	--
Effectiveness	--
Value	--
Values	--
Environment	A consistent theme within the literature on PSS [21], but the environment is rarely conceptualised or described in any depth.

Table 5:- Comparing PSS against the ABFS

PSS, despite its purported systemic nature, has given little in depth consideration of wider elements of a service system & how they might interact. "How is the environment conceptualised?" "How could a focus of service benefit & / or reduce the impact on the environment?" are relevant & pressing questions, but something deeper is needed. We can find this in other work on the Functional Economy [48] Natural Capital [54] & Ecotoxicology [55].

6 SUMMARY & CONCLUSIONS

This paper has had two aims; the first is to introduce the ABFS as a candidate integrative framework for Services research projects. The second has been to relate this framework to a number of Services research strands across disciplines.

As a sensitising framework, it is not meant to have ontological status; rather it aims to systematically relate strands of Services Research together. We have related the framework to four strands of Services Research, namely Service Blueprinting; the Service-Dominant Logic; the IHIP characteristics & debate; & Product-Service Systems.

Figure 3 illustrates at a gross level of how each aspect of the framework relates to several strands of service research. The scope is rated as being low, medium, or high. It is clear that the profile of each approach is different. For example, the SDL is heavily focussed around Value & Actants, as its concern is with the co-creation of value.

The headings refer to: the IHIP debate [11-14, 26]'; Service Blueprinting [e.g., 8]; Nelson's consideration of service values [17, 22]; the Nonownership paradigm [12]; the Service Dominant Logic [10]; PSS [e.g., 21]; Functional Products [20]; & the Functional Economy [48].

No current approach considers all the elements of a service system. Thus, the framework has shown where there are gaps in disciplines & perspectives. We can conclude that no single discipline involved in services research has a pre-existing framework suitable for integration of the knowledge, practices, solutions, general problems & scopes, across the many disciplines involved in Services Research.

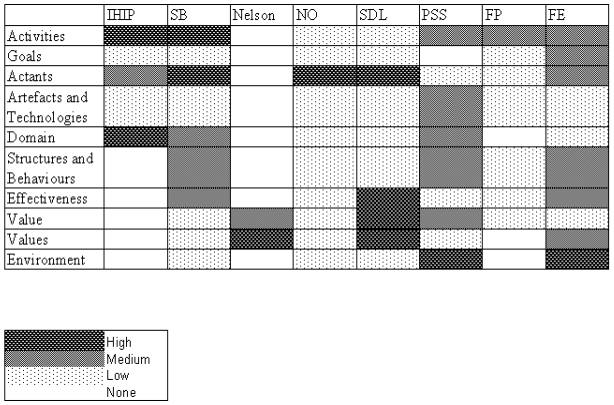

Figure 3: Scope of Various Service Research Strands against the framework

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