D3.2.2

The Akogrimo Business Modelling Framework

Version 1.02

WP 3.2 Business Modelling Framework

Dissemination Level: Public

Lead Editor: Martin Hafner, University of Hohenheim

11/11/2005

Status: Final

SIXTH FRAMEWORK PROGRAMME

PRIORITY IST-2002-2.3.1.18

Grid for complex problem solving

Proposal/Contract no.: 004293

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Context

Activity 3	**Architectural Framework**
WP 3.2	**The Akogrimo Consolidated Value Chain**
Dependencies	**This deliverable uses specifically the input of the deliverables D2.3.1 and D3.2.1 in order to provide a detailed business-oriented analysis of the testbed scenarios on the basis of the business modelling framework coming from the considerations from an economic viewpoint.** **It will be a basis for Activity 6 in order to connect value chain, business modelling, and exploitation aspects. Furthermore the deliverable will be used in order to refine the results of WP3.2 in Akogrimo's second cycle.**

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Approved by: **QM**

Version	Date	Authors	Sections Affected
0.1	07/08/2005	Hafner	2-3.2.1
0.11	07/12/2005	Bauer, Dietrich	3.2.2-3.3.2
0.12	07/14/2005	Dietrich	3.3
0.21	08/31/2005	Waldburger	4
0.22	08/31/2005	Mandic	5
0.31	09/16/2005	Waldburger	4
0.32	09/16/2005	Mandic	5
0.33	10/17/2005	Hafner	2-6
0.34	10/18/2005	Bauer, Dietrich, Loos	2-6
0.35	10/20/2005	Hafner	All
0.36	11/07/2005	Hafner	All
0.37	11/08/2005	Hafner; Kirn	All
1.0	11/08/2005	Hafner	All
1.01	11/08/2005	Hafner	1; 3; 5; 6
1.02	11/11/2005	Hafner	1-3; 5

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Abbreviations

4PLP	Fourth Party Logistics Provider
Akogrimo	Access To Knowledge through the Grid in a Mobile World
AmbMan	Ambulance man
B2B	Business-to-Business
B2C	Business-to-Consumer
BioSig	Bio signal
CardID	Cardiologist identification
CDS	Context-dependent Strategy
ClrOrd	Clearing Order
CLS	Cost Leadership Strategy
CTS	Conceptual & Teaching Strategy
DCDS	Degree of Customer Distance per Strategy
Deploy	Deployment
Dev	Devices
DFS	Differentiation Strategy
Dnav	Dynamic Navigation
Doc	Doctor
ECarLoc	Emergency car's location
ECG	electro-cardiogram
EHUP	E-Health User Portal
ER	Examination Result
FIC	Field Information Collection
FSS	Field Support
FT	Field Trip
GPS	Groupware Provision

HMES	Heart Monitoring and Emergency
HMES	Heart Monitoring and Emergency Service
HospLoc	Hospital's location
HospRoute	Route to Hospital
HSimDSS	Health Simulation and Diagnosis Support
IAS	Information Adaptation
IIS	Information Indexation
IMS	Identity Management
Inst	Instruments
IP	Internet Protocol
IT	Information Technology
LAN	Local Area Network
LSP	Logistic Service Provider
MAS	Medical Analysis
MDL	Medical Data Logger Service
MobDev	Mobile device
MPRL	Medical Personnel and Resource Locator
NRIS	Number of Role Instantiations per Strategy
NRISEI	Number of Role Instantiations per Strategy and Exploitation Item
Pat	Patient
PatDat	Patient Data
PatID	Patient identification
PatLoc	Patient's location
PatRelDat	Patient-related data
P&O	Planning and Optimization Service
PayOrd	Payment order.
PDA	Personal Digital Assistant

Ph	Pharmaceuticals
PLS	People Location
POTS	Plain Old Telephone Service
PSS	Project Symbiosis
RMD	Remote Medical Device Service
S	Stock
SDS	Service Discovery
SLA	Specialized Library Access
SMS	Session Mobility
SMS	Short Message Service
SP	Solution Provider
SPS	Simulation Performing
SSO	Single Sign-On
T	Transport
T-A	Transaction of Amount
T-S	Transaction of Sort
TAS	Teaching Assistance
TrafCont	Traffic Control
Trans	Translation
TrSurv	Traffic Surveillance
UPP	User Presence Provision
URC	User/Resource Context
URL	User/Resource Location
URS	User Registration
UserMgmt	User Management/Profile Management
USKR	Universtity/Student Knowledge Reselling
VEE	Virtual Emergency Environment

VEE	Virtual Emergency Environment
VEHR	Virtual Emergency Health Record
VEHRS	Virtual Emergency Health Record
VO	Virtual Organization
VoIP	Voice over IP
VoiP	VoIP
WESPU	Work Evaluation and Study Plan Update.
WiFi	Wireless Fidelity
WLAN	Wireless Local Area Network
WP	Work package

1. Summary

Mobile Grid services are of economic interest only if there are clear economic advantages for enterprises. On the one hand it is possible that enterprises use the Mobile Grid business in order to improve their efficiency (cost leadership strategy) or on the other hand to earn money from their effectiveness (differentiation strategy). Furthermore, enterprises can follow mixed approaches meaning that they seek for an optimum between cost leadership and differentiation strategy.

As in many cases in the Mobile Grid field there is a gap between enterprises' business strategies and their supporting information systems. This gap is filled by organizational issues, particularly by a process view. From the scientific viewpoint supply chains and logistic aspects are well known as strongly process-oriented. For this reason this deliverable proposes a logistic-driven and value chain oriented business modelling framework that is furthermore based on end customers' processes as well as a flexible service orientation.

This represents a highly innovative approach as current business modelling frameworks do not seem to be appropriate for Akogrimo's challenges as a comparing evaluation outlines. Beyond the different techniques offered to provide business models a concrete procedure for business modelling is suggested and performed by means of Akogrimo's emergency and e-learning scenario. The procedure comprises four main steps:

1. Customer processes as well as derived business processes from a information, material, and cash flow logistics viewpoint are modelled.
2. Value chain participants in the sense of actors in Mobile Grid supply chains and their relationships are represented in a specific supply chain model.
3. Domain-specific services provided by each of the actors are identified and described according to a detailed service description schema. The schema focuses among others on quality and reliability, service results, service environments (infrastructures), and financials. Finally the complexity, domain orientation, and specificity of each service is considered on the basis of its underlying logistics services.
4. For each generic Mobile grid services value chain participant a certain business strategy is proposed in a forecasting theoretical way.

Both the emergency and the e-learning scenario as well as their domain-specific participants are modelled from a process perspective: Starting from customer processes, their information, material as well as cash flow supporting processes are derived. All supporting processes are supported by means of services that are more or less complex as well as more or less domain-specific. Furthermore the generic Mobile Grid value chain participants are adopted according to the needs of each scenario in order to outline their relationships within a special supply chain model which is introduced to connect the pure economic value chain aspects from D3.2.1 ("The Consolidated Akogrimo Value Chain") in a first step with rather organizational issues.

All the services supporting the above mentioned information logistic processes are described according to a particularly developed standardized schema providing an overview of the service dependencies, the service providers and receivers (out of the generic and domain-specific Mobile Grid value chain participants) as well as payment aspects. Regarding the totality of each scenario's services they are analyzed in detail considering the amount of generic logistic services included. This is performed in order to rudimentarily proof the later in the deliverable described relationships between complexity, domain-specificity, as well as uniqueness of services and proposed business strategies.

Finally on the basis of the overall considerations in the area of business strategies as well as the business-oriented scenario descriptions first recommendations for all generic Mobile Grid value chain participants are provided. While network technology providers as well as payment providers are expected to follow cost leadership strategies, content and solution providers should follow differentiation strategies. Grid technology, access, and extended mobile device infrastructure providers should follow a context-oriented strategy depending on the context of each scenario.

Based in this analysis of these business modelling coherences, it is possible to point out the essential competitive edges for all Akogrimo industry partners after their exploitation plans are more concretised. Hence, this deliverable concludes with very initial hints on the role of types of Akogrimo partners in future Mobile Grid value chains. Based on their very early individual exploitation interests the types of partners are assigned to generic Mobile Grid value chain participant roles. Coming from these considerations a quantitative way is proposed in order to define each partner's dominating strategy (cost leadership, differentiation, or context-dependent strategy, but also conceptual and teaching strategy).

2. Introduction

Mobile Grid Services only seem to be justified if there are economic advantages for enterprises. This means that enterprises need to be able to generate competitive advantages by using a Mobile Grid infrastructure. For this reason it is examined in the last consequence of this deliverable which business strategies can be followed by today's telecommunication or Grid companies in order to maximize their benefits from offering services in the Mobile Grid field. Marginally, a particular business strategy for consulting enterprises and academic institutions is mentioned.

Abstracted from the many details of theoretical structures, such as Porter's Value Chain [18] introduced in D3.2.1 ("The Consolidated Akogrimo Value Chain") or Zerdick's Internet Economy [1], it can be stated that there are two major strategies for enterprises of the internet economy and the information society respectively:

- *Cost leadership* by providing services at very low prices. Consequently, standardization and high-performance technologies are necessary;
- *Differentiation* by individualizing products for example is a justified strategy.

Enterprises' strategic goals, such as striving for cost leadership or high differentiation, and their supporting information systems architecture are closely interrelated. For this reason it is necessary to provide mechanisms in order to align enterprises' information systems with their strategies. The very essential step of business IT alignment are well defined and strategy-aligned business processes as intermediaries between business models and information systems. This is outlined in Figure 1: Starting from a complex business environment certain patterns within universal business models can be identified, e. g. business processes such as the phases of an e-commerce transaction. Based on such organizational issues services can be derived that provide a flexible structural framework for information systems. Thus, from a business IT alignment perspective it seems to be a clear advantage if business modelling already follows a process logic and service-oriented approach.

Considering organizational and process logic aspects respectively in order to provide business IT alignment in the context of unknown future business models it is necessary to consider scientifically well-known business- and process logic-oriented artefacts with an existing collection of optimization mechanisms. Supply chains and their logistic challenges seem to fulfil these requirements as they can be considered as intermediaries between business-oriented value chains (D3.2.1) and information systems. Furthermore the main idea in this deliverable is that many of a company's business processes can be mapped to basic logistic functions apart from some very domain- and production-centred activities, for example (cf. Figure 1). These functions can in turn be realized as services belonging to a flexible, domain-independent service landscape. For this reason the concept of a logistics perspective on the Mobile Grid value network will be introduced in this deliverable as a basis for business modelling in Akogrimo.

Such strategic as well as architectural considerations will be managed by a business modelling framework to be developed in this deliverable. In general business modelling frameworks help to consider market structures as whole, develop innovative technologies in a target-oriented way,

and finally evaluate existing technologies according to their potential value added.[1] The need of business modelling frameworks is also outlined by [14]:

- Business modelling frameworks enable more rapid technological developments that are clearly business-aligned.
- Business modelling frameworks react in a very flexible way to increasing marketplace dynamics such as the deconstruction from value chains to value networks.
- The importance of business model innovation is continuously growing.
- In practice business models are or at least should be dynamic, especially in the domain of mobile technologies, networks and services. For this reason they need to be based on a reliable framework.
- Current literature mostly has a static view on business models. (Annotation by the lead editor: Business modelling frameworks in contrast seem to be able to support process logic aspects.)

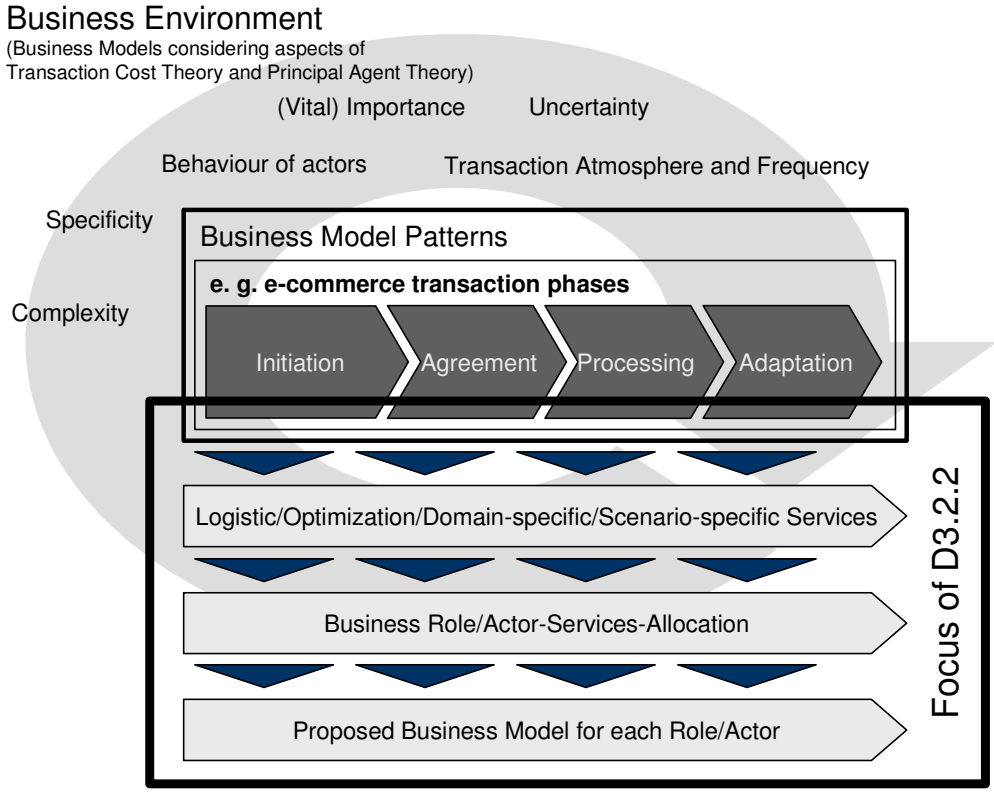

Figure 1 Alignment of business and technology issues (partly based on [2])

After the introduction section the over-all approach is described (section 3). Starting from Akogrimo's requirements on business modelling frameworks, the basic concepts of the suggested Akogrimo business modelling framework are outlined: First, value chain concepts are elaborated (cf. section 3.1) as well as Porter's competitive strategies (cf. section 3.2). In section 3.3 the logistic perspective is introduced which contains modelling supply chains. After that a three-sided

[1] In WP3.2 ("Business Modelling Framework") the value chain perspective dominates the enterprise perspective as the assignment of concrete enterprises to the generic roles in the Mobile Grid business will not be defined until D6.3.2 ("Initial Exploitation Plan") is completed.

classification of services (regarding their complexity, domain specificity, and exchangeability) is given and a schema for describing services is illustrated. Section 3 is completed by the evaluation of current business modelling frameworks according to general business modelling as well as Akogrimo's requirements. In this context the notion of business modelling frameworks followed in this document is outlined. In sections 4 and 5 the introduced techniques are applied on two of Akogrimo's scenarios: the emergency scenario and the e-learning scenario. The third scenario could not be added as the partners to be charged with the scenario are not already defined. The document ends with a discussion of the strategic implications of the deliverable's considerations, and proposes business strategies for the participants in the generic Mobile Grid value chain as well as for certain types of Akogrimo partners (section 6).

3. Approach

There are only two cases that assure any success of Mobile Grid services. Either Mobile Grid services push away existing structures that are providing accordant services today, or Mobile Grid services build new structures which will develop new business segments that can not be accessed in a different way. A more detailed description of this fact is given by Callon in the context of the competitive advantage of IT [3].

According to him positive contribution[2] can come from

- *Efficiency* measured by productivity (doing things better);
- *Effectiveness* (doing better things including: what an organisation could never do before);
- *Competitive advantage* (doing better and new things for the customer).

An adequate business modelling framework for participants in the Mobile Grid area has to focus in the last consequence on each participant's positive contribution. This means that there must be quite a clear answer to the question of the right strategy for every participant. Furthermore according to Akogrimo's Description of Work a business modelling framework has to analyze the following strategic aspects:

- It has to rely on the *concept of value chains*. Furthermore potential *cooperation and cooperation strategies* between the value chain participants have to be identified. These requirements are fulfilled by D3.2.1 which is the basis for this deliverable (cf. section 3.1).
- It must be possible to consider *several providers* of *different tiers*. This will be provided by means of supply chain and logistics considerations in section 3.3.1.
- The production of *complex services* or *products* must be included in the business modelling framework. This is performed by means of complexity considerations starting in section 3.3.2.1.1.
- *All entities* of the value chain must be regarded and *dependencies* between the different participants must be defined. This item is regarded by a clear service orientation starting in section 3.3.2.
- Adequate *models* for handling business problems must be provided. Such models can be found in this deliverable, e. g. process models (cf. sections 4.1 and 5.1), supply chain models (cf. section 3.3.1), or service descriptions (cf. section 3.3.2.2).

Together with requirements for current business modelling frameworks the above mentioned requirements are used to evaluate today's frameworks in order to clarify the need of an innovative approach in the Akogrimo project (cf. section 3.4).

3.1. Concept of the Value Chain

The very famous starting point for value and supply chain considerations[3] is Porter's value chain as it was depicted in deliverable D3.2.1 "The Akogrimo Consolidated Value Chain". In this section a short survey of the main results in D3.2.1 is given:

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[2] Efficiency considerations will be performed in section 3.2.1 while effectiveness and competitive advantages are addressed in section 3.2.2.

- Porter's value chain seems not to be sufficient in order to discuss the value adding activities in providing Mobile Grid services because of its generic character as well as the fact that today there are more current models such as Zerdick's ideas [1].
- Beyond Porter's value chain the behaviours of all market players in the context of Mobile Grid services provision should be taken into account in a systematic way.
- Nevertheless it is necessary to have a starting point such as linear e-commerce transaction phases (cf. section 2) in order to analyze potentials for cost reduction or differentiation by using Mobile Grid services

As a conclusion Porter's traditional value chain seems not to be adequate enough for analyzing the very complex dependencies between business actors in highly distributed business networks. For this reason more sophisticated business networking models as well as economic theories were used in D3.2.1. Nevertheless in order to stay in contact with Porter his ideas on competitive advantages will be taken up in section 3.2.

3.2. Basic Strategies for Competitive Advantage

This section shows how to generate competitive advantages starting from Porter. For this reason the two business strategies already mentioned in section 2 are shortly described.

3.2.1. The Cost Leadership Strategy

The main idea of a cost leadership strategy in the Mobile Grid services context is to reduce transaction and production costs by using Mobile Grid technologies in certain areas where they can offer obvious benefits from a business perspective.

The reduction of transaction costs means that information and coordination costs descend as well as subsequent costs which occur because of deficient quality.

Production costs can be reduced by specializing on a small number of core competencies and atomic services (cf. section 3.3.2.1.1) respectively that can be performed in a more efficient way than competitors are able to. In a later stage of the value chain the atomic services can be reassembled, especially by value network participants that try to offer services that are highly different from those of their competitors (cf. section 3.2.2). Consequently cost reductions are mainly supposed to be achieved by using economies of scale rather than economies of scope.

Together with Mobile Grid technologies information supply and coordination can be improved resulting in quality enhancements. Furthermore Mobile Grid technologies could help to solve today's mass production problems seeking for efficiency.

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[3] Supply chains normally include Planning, Procurement, Manufacturing, Order Management, Logistics, Returns, and Retail; Product and Service Design including Design Planning, Research, Prototyping, Integration, Launch and Revision, and Sales including CRM, Service Support, Sales, and Contract Management which are congruent to the Porter framework. Value chains have a more extended view. They furthermore include aspects of market, research, definition, selling and support [13]. In the context of this deliverable value chains are rather clearly business-oriented while supply chains focus on process logic aspects in the field of material and non-material goods. Of course value and supply chains are not independent at all.

In order to have some more detailed analysis the starting points of all considerations in this deliverable are customer processes. A generic example of clear customer orientation is the e-commerce transactions chain shown in Figure 2. If a participant of the Akogrimo Value chain is expected to follow a cost leadership strategy, it has to identify principal cost reductions based on such customer processes.[4]

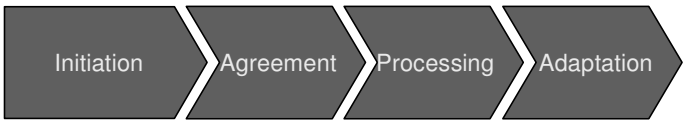

Figure 2 Cost leadership options along the e-commerce transactions chain enabled by the application architecture

In particular Figure 2 shows, that there is some initial interaction with the customer that leads to an agreement. How this goal can be achieved depends on the kind of product as well as the right strategy to interact with a potential customer. Presumably, sophisticated Mobile Grid services can open more adequate interaction channels for today's and future's customers respecting their privacy and surveillance concerns. After the agreement is achieved it is necessary from a cost leadership perspective that all production and service offering activities are as cheap as possible for the enterprises. By the means of Mobile Grid services information services could also be offered in a faster way for example. Finally there is a certain phase of adaptation in order to keep the customer.

3.2.2. The Differentiation Strategy

Differentiation is Porter's second strategy. It makes companies unique from the customer's point of view. In opposite to the cost leadership strategy, differentiation allows to establish more than one leader in a branch. It depends on the source of differentiation, i.e. the decision on which part of the value chain the company will specialize itself for the customers.

Companies have several starting points in order to get a unique position within a particular branch. Some of the sources of differentiation are:

- Research and development (related to products and technologies),
- Marketing mix,
- Production,
- Logistics.

The following paragraphs focus on two main approaches for realizing competitive advantages: differentiation of products and differentiation of supply chains. The first approach focuses business-to-consumer interactions (i.e. company and customer), the latter one business-to-business interactions (e.g. producer, supplier, and logistic service providers).

- *Differentiation of products.* It is obvious that differentiation at the product level allows companies to achieve a unique position in their markets. Products can be manufactured by new and innovative technologies or they can be produced due to the needs of each particular customer. If so, products are customized. By individualising every single order product

[4] A more detailed approach to derive supporting business process from a customer process is introduced in sections 4.1 and 5.1 respectively.

properties, the demand of the consumer will be matched optimally. Even price individualization can be a method for realizing differentiation strategy.

- *Differentiation of supply chains.* As one of the major assumption of this strategy product differentiation is only one way to make companies and their products unique. Differentiation can occur on several stages of the value chain. Customer satisfaction can be maximized if companies have extraordinary customer services, fast logistic systems, or high delivery time reliability. Then, this allows a price premium. Although IT will no longer be a competitive advantage by its own, new technologies such as Mobile Grid services can improve supply chain processes and inter-organizational cooperation.

The differentiation strategy causes higher cost inside the value chain. So, the benefit of differentiation depends on the unique value of the companies' products and services for the customer. Being unique results in spend capital into one or many of the sources of differentiation. But, companies must be aware that perceived values and real values of the unique product can be distinguished. The first kind (criteria for usage) expresses the value in fact, e. g. hard customization of products inside the production process. The second (criteria for signalling) represents the value from outside for customers, e. g. packaging, brand, or identification.

Of course, risks of differentiation must be considered, too. Uniqueness is out of value if customers are not willing to pay additional prices for the special products and services. In the same way too much differentiation causes too high costs and fewer acceptances by the customers. Finally, differentiation must not be overdrawn due to the needs of consumers and its value has to be signalled in order to be recognized by them.

Mass customization is considered as a hybrid strategy because it combines mass production and made-to-order production. Here, differentiation is mainly realized by product customization but also by having flexible and multistage supply chains based on the core competence of each participant. As companies that offer mass customized products handle personal data for every single order they seem to be unique for customers. But, in order to be successful in business companies have to establish IT infrastructure that allow data management through the whole supply chain. This does not only include transmission of order data but also need for computational power (e.g. order routing, configuration systems based on artificial intelligence, adjustment of sewing patterns etc.).

If Mobile Grid Services will be successful this technology has either to reduce additional costs of differentiation or enable new products and services which have not been possible to realize yet. In detail, Mobile Grid services seem to realize differentiation advantages in the following value chain stages (cf. Figure 2):

- *Initiation and agreement stage.* Product development, configuration system development, capacity planning for existing configuration systems, scheduling customer appointments, pricing strategies
- *Processing stage.* Product specification by using a configuration system, order creation and acceptation, preparation of order for manufacturing, estimation of delivery date, procurement, manufacturing, supply of material, quality check, shipping order and distribution, delivery to vendor, retailer, or customer
- *Adaptation stage.* Customer service, complaints and reclamation, prepare for re-orders

As mentioned above, the differentiation strategy allows enterprises to provide products and services that they could never do before. In addition, the competitive advantage arises from aiming at the customers' (end users') needs consequentially. This causes multi-stage communication (bidirectional from end user to n-tier supplier) and acceleration in order to make fast reactions on environmental changes possible.

3.3. Supply Chain and Logistics Perspective

This section shows what has to be done in order to identify sure competitive advantages for enterprises in the area of Mobile Grid services. At the beginning, all scenarios must be modelled in a standardized form. Therefore, section 3.3.1 describes an approach for modelling supply chains. Together with logistic aspects they are used to fulfil Akogrimo's Description of Work requirement of considering the several providers of services and products on different tiers (cf. section 3) as well as of relying on the concept of value chains[5]. Further reasons for the introduction of supply chains are already mentioned in section 2. After that, different types of services (section 3.3.2) and a service description scheme (section 3.3.2.2) are illustrated.

3.3.1. Modelling Supply Chains

For the derivation of a scenario-specific set of services a basic supply chain is used (Figure 3).[6] This model includes aspects of the mass customization concept [4], [5] which considers cost aspects but also is quite conform with the differentiation strategy that seems to be interesting for today's potential participants in a future Mobile Grid services market. As illustrated, the supply chain is modelled with two kinds of symbols: actors (nodes) and transactions (edges). Each actor is shortly described in the following section.

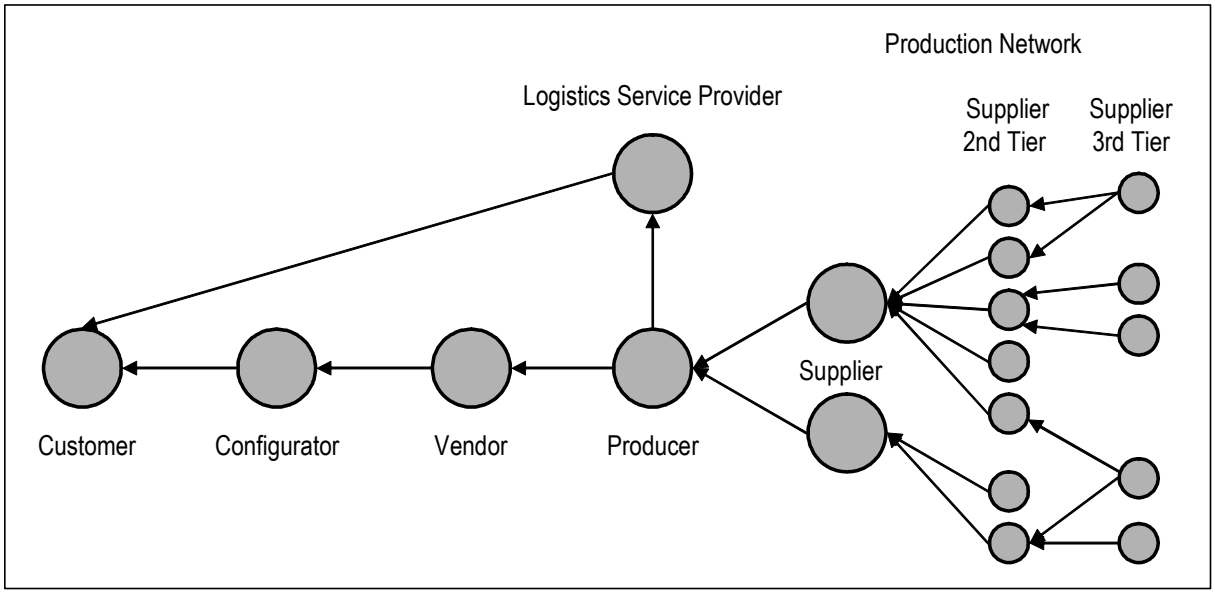

Figure 3 Generic supply chain model with standard actors (based on [6])

- *Customer*. The customer is the demander and consumer of the final product. But, the model supposes that in mass customization scenarios as well as in Mobile Grid scenarios customers are more actively involved in comparison to conventional service provision. Each customer has the chance to express his specific needs and desires in order to get customized goods on demand. The customer is a partner in the supply chain ("customer integration") [7].

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5 The dependencies between supply chains and value chains are outlined in footnote 3.

6 The arrows represent the main goods and information flows towards the end customer, while cash flows rather point to the other direction.

- *Vendor*. The organization that offers customized goods on the market is called vendor ("market maker"). It can also be a selling and marketing focused enterprise with no production plant. Therefore, the real net output ratio is low but there is a high degree of branding activities.
- *Configurator*. The configurator is an interface or intermediary between the vendor and the customers. With it, all necessary individualization data must be collected. On the one hand, the customer's product requirements and the values of all product option parameters are identified. On the other hand, a configuration system has to ensure that only valid and complete product specifications are approved for ordering.
- *Producer*. This actor is responsible for planning, coordination and execution of manufacturing processes. Depending on the degree of vertical integration, production steps can be made in-house or substituted with external parts.
- *Supplier*. As part of the production network, these actors provide the producer or other suppliers with standardized or customized product components. The producer and the suppliers establish the "production network".
- *Logistics Service Provider (LSP)*. This actor assumes the task of product distribution. This is accomplished by interacting with other actors, such as supplier, producer and vendor. While the LSP's interactions with other actors are shown, the internal and interplant logistics processes are not shown in this model. The main task of the LSP is to transport the customized good from the producer to the customer.

Even though the described supply chain originally suggests production of material products mainly, it is also applicable for non-material goods (such as digital goods or services) as well (cf. service individualization as described in [4], p. 253). Thus, the definition of mass customization is not restricted to products only. Based on this actors-oriented visualization relationships and transactions of business partners can be modelled.

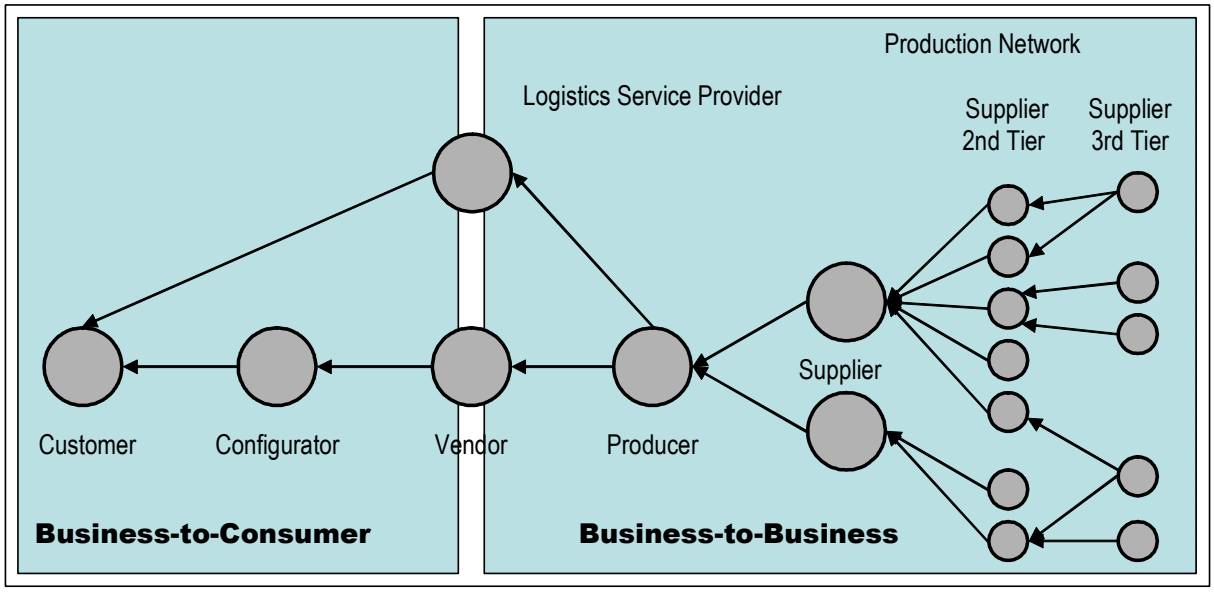

Figure 4 Consumer and business perspectives (based on [6])

The supply model in Figure 3 is used for deriving logistic services that allow modelling domain scenarios. Again, as shown in Figure 4 the business-to-consumer (B2C) perspective has to be considered as well as the business-to-business (B2B) view. Products and services are created within global supply chains, but the added value provided by the companies must aim for the customers' needs. Therefore, a seamless information flow has to be managed through the whole

supply chain. In the context of this deliverable this should be realized on the basis of a Mobile Grid infrastructure. If companies offer enhanced logistic services for other enterprises they can considered as so-called "4th party logistics providers" (4PLP). They seem to be ideal participants of the Mobile Grid supply chain. 4PLPs bundle their own resources and technologies with those of other service providers in order to offer end users logistic support within the whole supply chain. In the case of Akogrimo they offer Mobile Grid-based services either for B2B- or B2C-related transactions [8].

The underlying principle of the next sections is a supply chain- and logistic-oriented view. As transformation processes will principally not be considered mainly the supply chain structures (vertical and horizontal supply chains) are discussed. The *supply chain perspective* contains material and information flows as well as transformation processes. A *logistics view* concentrates on time and spatial modification of any kind of resources. In the following, transformation processes (such as production steps) will not be discussed in detail but as black boxes. Therefore, the logistic perspective allows encapsulating basic logistic functions. After this abstraction generic logistic services are provided as shown in the next section. Algorithms of logistics services will not be provided but their coactions in order to keep a wide level of abstraction from software technologies.

The definition from Council of Logistics Management describes logistics as a set of activities for manufacturing, protection and improving of the availability of all persons and means: Logistics is "... the process of planning, implementing, and controlling the efficient, effective flow and storage of goods, services, and related information from point of origin to point of consumption for the purpose of conforming to customer requirements. Note that this definition includes inbound, outbound, internal/external movements and returns of materials for environmental purposes." [9] In the "seven-rights-definition" of Plowman it was argued from the view of activities: Logistics' meaning is the integration and coordination of availability of the right product, right quantity, right condition, at right place, at right time, to right costs and to right customer [10].

3.3.2. Service-Orientation in Supply Chains

In order to support high individuality in supply chains in an efficient way, services between business partners, including Mobile Grid offering partners (B2B), and customers (B2C) have to be negotiated and their results have to be exchanged.[7] On this basis flexible service-oriented workflow architectures can be planned for each of the participants in the Mobile Grid services value chain (described in D3.2.1 ("The Consolidated Akogrimo Value Chain")) in future stages of the business-technology alignment in the Akogrimo project.

In this section the service concept is introduced and different dimensions of service classification are provided (section 3.3.2.1). Afterwards a schema is introduced permitting structured service descriptions from a business perspective (section 3.3.2.2).

3.3.2.1. Types of Services

The different actors of the supply chain model in section 3.3.1 provide services in order to meet their customers' individual needs. In the Akogrimo context mainly services focusing on

[7] For this reason service orientation is introduced in the business modelling framework (cf. the beginning of section 3).

information are desired. As it was already mentioned in section 2 supply chains and their logistic challenges seem to be very adequate to be considered as intermediaries between business questions and information systems as many of a company's business processes can be mapped to them apart from some very domain- and production-centred activities for example. For this reason *logistics services* can be expected as a certain kind of core services that can be orchestrated as bulked logistics processes and are mainly focused in this section. Furthermore some business-specific services are necessary basing on those logistics services.

The term "service" is multiply used in science and practice. First it needs to be clarified, what is the meaning of services. Services are not materially, can contain material components, for example a carrier medium, on which the result is handed over to fulfil the service. The production and the consumption of the service collapse usually temporally.[8] For logistics it is important to assure disposability of the right transport goods in right quantity and quality at right time to right customer in right costs. So, these three basic services transport tasks lead to the process result of delivered goods besides administrative and strategic tasks e. g. planning, analysis, and logistic system design. Basic Characteristics of services agreed in literature [9], [10] are that services

- are not storable,
- need an external factor (characteristics of integrating external factor),
- are rarely transferable (characteristics of service immaterialitility).

E. g. from a logistic viewpoint of a removal firm this means, they offer a service named "removal". It is not possible for customers and contractors to produce and use the "removal service" from stock. It can not be stored, so the company has to backup human and material resources. The service also needs to integrate the external factor, i. e. the customer or the customer's property. There will not be a removal from place A to B if the furniture of the customer is not integrated. Production and consumption of the service take place at the same time. It is possible to see removal employees carrying something, but the process of removing is the service itself.

For a common understanding it is necessary to provide three distinguishing dimensions for classifying services, which will be explained in the following sections:[9]

- Complexity (cf. section 3.3.2.1.1),
- Domain abstraction (cf. section 3.3.2.1.2),
- Specificity (cf. section 3.3.2.1.3).

3.3.2.1.1. Classifying Logistics Services by Means of Complexity

Complexity plays a central role to distinguish different services. Not only in the case of a logistics view it is obvious that if there are arising numbers of elements in a system (here: logistics services), this will lead to a larger degree of complexity. So for this section, four levels of service

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[8] This business-oriented service definition is compliant to the rather general or technology-oriented definitions of services given in D2.1.1 ("The Akogrimo Market Players") where a service is "work done for others as an occupation or business" or in D3.1.1 ("Initial Overall Architecture") where "a service is a function that is well-defined, self-contained, and does not depend on the context or state of other services."

[9] A third dimension for describing services is proposed in section 6.1.

complexity are explained. Complexity in the sense of this deliverable refers to the behavioural characteristics of a system, a model, and consequently a service. The different levels of complexity in the context of logistics services are called:

- Atomic services;
- Bundled services;
- Service patterns;
- Orchestrated services.

The single descriptions in this section will be summarized by a figure of the "hierarchy of services" (Figure 5).

Atomic Services

In order to model supply chains from a logistics perspective, it is necessary to look at basic logistic functions. It has been proofed by literature that four kinds of basic functions can be distinguished: *transport* (spatial modification), *transaction with changes of sort*, *transaction with changes of amount*, and *storing* (time modification) [10]. This classification can be applied to material logistics as well as to information logistics. With respect to the chosen modelling approach, atomic services cannot be refined or separated into sub-services.

There are two kinds of atomic services. This is caused by focussing either the above-mentioned *basic executing logistic services* or rather the *planning and optimization services*. One or more latter services refer to one or more basic logistic services. Methods for reaching these goals are for example information requirements analysis, material or information flow optimization (e. g. routing, scheduling), and finally setups of high technical and organizational flexibility.

Basic executing logistic services:

- *Transport (T).* From the latin "transportare" (which means to carry, to handle over something) this means the process of transportation (e. g. to drive, to carry, to send, etc.) of persons (transportation of passengers: taxi, public transport, line or charter traffic), goods (goods traffic), or information (e. g. between mobile devices and Grid resources based on network services but also within a single Grid resource) from one place to another. It describes the spatial change of transportation objects by means of different transporting capacities (means of transport).
- *Transact (T-S/T-A).* There are two kinds of transactions of goods and information: First, there is the change of sort (T-S). This means that some logistic actions are performed to assort different goods or information (e. g. indexing pictures resulting from a field trip). Second, the amount of goods or information can be changed (T-A). In this case the quantities of a single type of goods or information are up-scaled or down-scaled (e. g. transfer of data packages). In the case of combinations of T-S and T-A the term "production" will be used in this deliverable (e. g. analysis of bio-signals offering the basis for a diagnosis).
- *Stock (S).* To stock is the activity of buffering goods or information at a place or storage medium that is adequate for transport availability needs. The reason of storing something is based on bridging, saving, checking, ageing or, time or space lacks.

Selected planning and optimization services (P&O):

- *Routing.* This service looks for optimal routes of information or goods to be transported. Many constraints have to be considered such as the capacities of transport routes, in time deliveries etc. Finally, many of the routing problems can be mapped to the travelling salesman problem [21].

- *Scheduling.* If time budgets needed by certain activities are clear and their exact time to be performed respectively, a scheduling algorithm can provide optimized schedules that have to respect flexibility constraints for example.
- *Capacity Determination.* This service considers how large to plan storage infrastructure for material goods as well as for information. This depends on service degrees (probability of non-appearance of inability to deliver within a certain period), cost of storage, process time for working a certain product, and the standard deviation of a product [19].
- *Demand Analysis.* Customer needs continuously have to be checked in order to control and adapt the products/information offered. This means products/information without demand or real benefits have to be systematically excluded [21].
- *ABC/XYZ Analysis.* In practice it is quite clear that it is not possible to manage all information/goods offered with the same method or to put them the same attention on them. If every particular case is considered, management will be too expensive [21]. For this reason it is important to identify the most and the least often required information/goods in order to treat them in a special way or to stop their provision repectively.
- *Tracking and Tracing.* This service includes orders and order states (e. g. basic data, time, location, quality, costs) as information objects for the controlling of supply chains. It offers the possibility to give information on the order status in every state of the order and delivery process [20].
- *Optimization of Locations.* In order to optimize the positioning and number of locations several considerations have to be performed, e. g. costs of material/information delivery, storage costs, production costs, or transport costs to end customer [21].
- *Optimization of Capacities.* This service comprises aspects like positioning, dimensioning, structuring of resource nodes, appointment of factor of production needs and consumption [22].
- *Runtime Controlling.* This service captures certain metrics [21] along the information/material goods supply chain and offers actions to countersteer.
- *Accountancy. (Angebot und Koordination von Finanzdienstleistungen)*
- *Retrieving.* A retrieving service contributes to identify information or goods in the context of any executing logistics service.
- *Localization.* In the context of mobile systems a basic logistic services offers the localization of resources.

Bundled Services

The accomplishment of atomic services from the basic logistics and respective services from the planning and optimization field will be called *bundled services*. As each basic logistic service has to be planned or at least can be optimized by supporting services the combination of one basic logistic service and one adequate planning and optimization service seems to be a meaningful matter in order to deliver standard service bundles. For instance the concept of transportation has often to be combined with a routing service in order to find the ideal way for a car or a piece of information.

Patterns

Patterns are composed of bundled services and atomic services. They include one or more atomic services that belong together in the chosen context of the pattern and consist of one or more

service bundles. In the context of this deliverable patterns use a formal approach describing a logistic design problem, its proposed solution, and any other factors that might affect the problem or the solution. A successful pattern should have established itself as leading to a good solution in several previous projects or situations.

For instance complex logistic services, based on several combinations of atomic services are usually already preconfigured at built time. They offer a kind of standard solution for providers of complex logistics solutions as it is the case for all participants in a Mobile Grid value network. For example a Grid resource provider offers its computing capacities (i. e. transaction capacities) to potential customers. In order to avoid overflow problems a scheduling service is necessary.

Orchestration

Orchestration of logistics services means that service patterns as well as atomic and bundled services are combined and formed according to certain purposes of complex processes of one or several customers. A good example of logistics services orchestration can be taken from construction site logistics where excavated ground normally can be used to build walls without being stored intermediately. Nevertheless excavation and building activities often stay decoupled. Higher complexity based on the construction at run time, so that they are designed and combined when services are requested.

In Figure 5, the overall understanding of the above-described hierarchy of logistic services is illustrated.

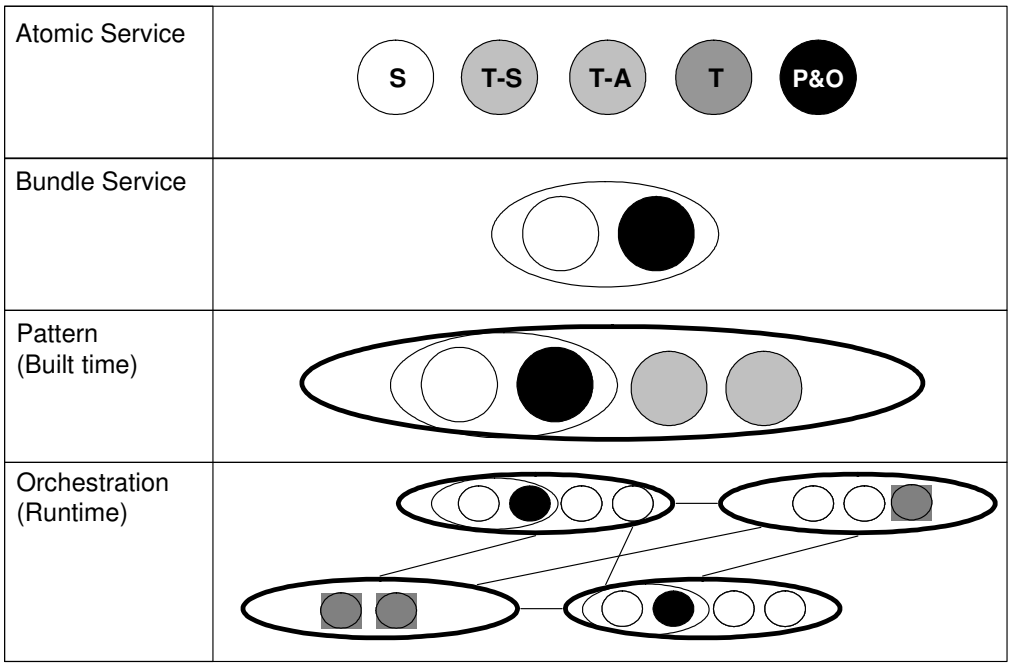

Figure 5 Hierarchy of logistic services

According to Figure 5 there is an architecture of four layers which build up on each other. The first row shows the four basic kinds of executing atomic services: S (storing), T-A (transaction of amount), T-S (transaction of sort), and T (transport). They are the smallest, not dividable service instance in this modelling concept. If atomic services are combined with atomic planning and optimization (P&O) services (e. g. transport with routing), a bundled service is set up. Patterns are designed with several bundled as well as atomic services supporting repeating problems. This means that they have formal capabilities. The fourth and last layer shows the runtime built orchestration. Here some patterns will be combined to have a larger range of service capabilities. On the orchestration level, global supply chains will be modelled.

3.3.2.1.2. Classifying Services by Means of Domain Abstraction

As it was outlined in section 3.3.2.1.1 and will be furthermore proofed in sections 4.3.2 and 5.3.2 Mobile Grid-oriented services can be represented by means of logistic services of different complexity. Nevertheless for optimization reasons services performed in a certain scenario normally are not described at the level of logistic services but of more scenario-specific levels. For this reason a shell model is introduced in this section considering the different degrees of domain abstraction. This concept determines how generic or specialised particular real-world services are. Thus, in this deliverable services are distinguished according to three classes:

- Logistics services
- Domain-oriented services
- Scenario-oriented service

The conjunction of service class and domain abstraction is illustrated in Figure 6. As one can depict from this model, logistics services of different complexity are the most generic services, ideally without limitations to a particular domain. Founded on these basic services there are domain-oriented services. Here, services have dedicated relations to a specific domain or still more detailed sub-domain such as healthcare and emergency management or automotive and technical service. Finally, scenario-/case-oriented services clarify services that are needed in specific scenarios of a particular domain, for example heart attack scenario or car reparation scenario.

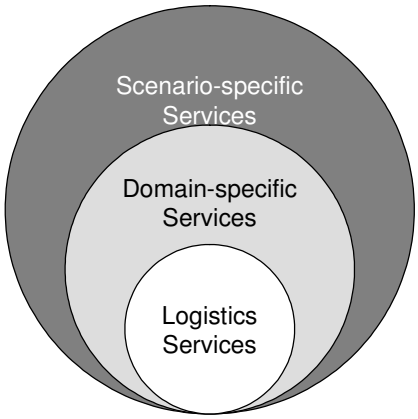

Figure 6 Shell model of services[10]

3.3.2.1.3. Classifying Services by Means of Specificity

A third dimension to classify services is their specificity. Two main instantiations can be distinguished:

- *Generality.* Services are called "general" if the effort to provide the service is quite low for each of the supply chain participants.
- *Uniqueness.* In contrary, if it is quite hard to build up resources and competencies to provide a service, high investments are necessary for a supply chain participant. Such resources will only be build up if there are real benefits for the participant.

[10] The shell model does not show sets of services that are superior or inferior to each other, i. e. domain-specific services do not contain logistics services for example, but domain-specific services base on logistics services.

Specificity is also closely linked to the exchangeability of a participant in the supply chain. For this reason it also seems to be an indicator for the business strategy of participants in Mobile Grid services value chains.

3.3.2.2. Service Description

All these influences and approaches from services, complexity and abstractions are leading to a description framework derived from all theoretical concepts and basics [11], [12]. Independently from its level of complexity or domain-specificity each service can be described according to the following criteria. Such standardized descriptions of each service are needed to work out and define clear distinctions between them. It is a further goal to describe, collect, and encapsulate all needed data of the service description (amongst others resources), not from a technology perspective but from a business perspective with high process logic orientation. The service description is structured in four main areas and fifteen sub-areas named description criteria. The main areas categorize four main directions: basic and detailed information about a service, its subordination towards other services and supply chain orientation.

- *Area of service basics.* For the first mayor category four description criteria have to be considered. Every service will be named consequently according to his relation to all atomic, bundled and orchestrated services. This will be followed by a short description which explains in more detail what the service contains. In order to give a more precise description of the service its outstanding goals have to be identified. The last criterion show the characteristics whether a service is rather designed for planning or execution tasks.
- *Area of service details.* There are five description criteria which contain the providers, receivers, resources of a service as well as its service level. The goal is to get some information on who are the involved parties, what are their main roles, and what resources and kind of infrastructures are needed to fulfil the service. The minimum and the quality service levels describe how the performance will be achieved. The minimum service level describes what has to be done in order to satisfy the service receivers. If there is a commonly agreed quality level with more than the absolutely needed actions, processes or goals, this will be noted as quality level.
- *Area of service subordination.* There are three description criteria that aim on the subordination of the whole service towards other services. Consequently there are service interfaces and further service dependencies describing how, how many or in which way services are connected to the considered one. Critical success factors consist of positive or negative aspects influencing the planned service execution.
- *Area of supply chain details.* There are three description criteria connecting to supply chain interests. The supply chain coverage discusses how far the providers of the service (according to Figure 3: actors) are away from the customer referring to their distance in Figure 3. The cost model focuses on if and how money will be earned. This scale can lead from fixed tariffs to no payment or earnings that come from earlier services. Value chain earnings will increase the potentials of those who will mostly profit.

As it was already said each atomic service, bundled service, service pattern, and orchestrated service can be described according to these criteria. In Table 1 where a detailed overview of the description criteria is given only the term "service" is used. Nevertheless more complex service structures are considered.

Description Area	Description Criteria	Criteria Definition
Service Basics	Service Name	Name of the service according to all atomic, bundled, and orchestrated services as well as service patterns mentioned in each scenario
	Short Service Description	Consistent description of the service from the service provider's viewpoint
	Service Goal(s)	Expected aims and results of the service
	Service Characteristics	Planning vs. executing service
Service Details	Service Provider	Generic Role of Service Provider according to 3.2 in D3.2.1 Name of Service Provider according to section 4.2/5.2 in D3.2.2
	Service Receiver	Generic Role of Service Receiver according to 3.2 in D3.2.1 Name of Service Receiver according to section 4.2/5.2 in D3.2.2
	Required Resources	Description of all resources, capabilities, or infrastructure needed to perform the service
	Minimum Service Level	Minimum of what is expected to fulfil the service
	Quality Service Level	Description of highest possible quality to fulfil the service goals
Service Subordination	Service Interfaces	Interfaces of the service
	Further Service Dependencies	Dependencies of the service regarding other services described according to this scheme
	Critical Success Factors	Factors to be considered as critical for the success of the service
Value Chain Details	Supply Chain Coverage	Tiers in Figure 11 in section 4.2/Figure 15 in section 5.2 covered by the service (Tier 1 = Customer).
	Cost Model	Founded cost model (e. g. pay per view, pay per use, fixed tariff, …)
	Value Chain Earnings	Service sponsor

Table 1 Criteria for the description of services

3.4. Related Work on Business Modelling Frameworks

In literature there are many different understandings of business models what can be seen in an annotated literature survey provided by [23]. Nevertheless there is a certain number of attributes common to several business model concepts as shown in Table 2.

Attribute	Frequency
Actors/Roles	64%
Enterprise Considerations	54%
Finance/Business Volume (Flows)	54%
Goods/Services (Flows)	50%
Added Value	43%
Abstraction/Aggregation	32%
Competitive Environment	32%
Strategy/Vision/Goal	29%
Benefit	25%
Value Chain/Core Competencies	25%
Earnings	21%
Information (Flows)	21%
Processes/Procedure	21%
Actor relationships	18%
Technology	18%
Enterprise Unit Considerations	14%
External Communication Concept	11%
Form of Organisation	11%
Growth	11%
Legal Aspects	11%
Resources (General)	11%
Enterprise Network Considerations	7%
Critical Success Factors	7%
Product Life Cycle	7%
Control Mechanisms	4%

Table 2: Relative frequency of business model attributes according to [23]

Table 2 will be used in section 6.3 in order to evaluate not only the appropriateness of the business modelling framework provided in this deliverable according to Akogrimo's requirements but also according to general attributes of business models. Nevertheless it is necessary to focus primarily on the most relevant aspects for the Mobile Grid domain. Thus, according to ID3.2.1 ("Survey on Current Business Models") adequate frameworks for business modelling in the Akogrimo context contain:

- Relationships between telecom operators, service providers, software vendors, end users, and other market players
- Risk considerations regarding economic strategies but also security aspects;
- Reliability, meaning that each service consumer receives a certain quality of service;
- Scalability, i. e. complex and interdependent service level agreements must be negotiable.

3.4.1. Description of Innovative Business Modelling Frameworks

In section 3.4.1, beyond the Porter value chain already depicted in D3.2.1 ("The Akogrimo Consolidated Value Chain"), only rather innovative business modelling frameworks that are quite closely related to Mobile Grid services are considered.

3.4.1.1. Framework for Defining E-Business Models

Pigneur introduces a framework for defining e-business models [15]. This approach is chosen for this deliverable as it considers e-business and provides an ontology that offers a real conceptual framework. The main aspects of Pigneur's framework are summarized below:

- Levelled structure, decomposition with increasing depth and complexity;
- Four main pillars:
  - Products/services: value proposition offered to a specific target customer segment on the basis of certain capabilities;
  - Relationships: feel and serve for customers for enduring relationships; need of customer information in order to achieve customer trust and loyalty;
  - Infrastructure: relationship of resources and assets, activities and process configuration, partner network;
  - Financials: revenues as sold value, profitability as difference between revenues and costs.

3.4.1.2. Strategy Business Model Framework

The Strategy Business Model Framework is chosen because of is particular strategy orientation that was outlined as a very central aspect for business modelling frameworks in section 3. The Strategy Business Model Framework contains five main areas with some detailed aspects [17]:

- Market potential/cost structure of the business:
  - Target inefficiencies in the value chain;
  - Scalability;
  - Appeal of low-service levels in the industry;
- Pricing and advertising potential:
  - Price discrimination;
  - Customer data;
  - Versioning and targeting;
  - Legal issues;
- Barriers to entry/first mover advantages:
  - Network externalities;
  - Switching cost/lock-in;
  - Scarce assets (legal, reputational, strategic);
  - Channel conflicts;
- Alliances:
  - Complementarities;
  - Merge, ally or go it alone decisions;
- Sustainability:
  - Potential competitors;

- Potential new markets.

3.4.1.3. The Core + Complement Business Model Framework

The approach from Krüger et al. is quite interesting for the Akogrimo Business Modelling Framework as business models are differentiated into their core components as well as their special components [16].

According to this approach core components can be easily identified for most business sectors answering the question what is needed to run a business. After the core components are structured additional or complementary components can be found. The more complex an industry is, the more difficult it is to find an appropriate business model. Nevertheless, it has to be stated that the approach focuses on online news and is mainly planned to be used in the content business.

3.4.1.4. Dynamic Business Model Framework for Emerging Mobile Services

The approach from Kijl et al. focuses on an evolutionary and dynamic view on business models [14]. For the authors "a business model describes the way a company or network of companies aims to create customer and network value." For this reason it focuses on the service concept (value proposition, target group), the technological architecture (service delivery system), organizational arrangements (division roles, network strategy), and financial arrangements (revenue model).

Furthermore dynamics are discussed. For this reason a development process from the business idea to established businesses is introduced with several phases, such as service development, business planning, innovation diffusion, venturing, and marketing. Technology, implementation, and marketing are considered as the most important phases that are also most influenced by external factors, e. g. emergence of presence technology, influence of governmental bodies, or the increasing demand of services.

3.4.2. Evaluation of Existing Business Modelling Frameworks

According to section 3 there are a certain number of requirements for the Akogrimo Business Modelling Framework. Some of them were already discussed in D3.2.1 ("The Akogrimo Consolidated Value Chain") while most of the requirements are more exactly described in sections 3.2 and 3.3. These requirements are completed by the requirements in section 3.4 coming from the considerations on current business models in ID3.2.1.

In Table 3 the business modelling framework approaches described in section 3.4.1 as well as Porter's value chain are evaluated according to the above mentioned criteria.

Requirements for Mobile Grid Business Modelling Frameworks	Requirements for current Business Modelling Frameworks	Evaluation Criteria	Value Chain [18]	Framework for Defining E-Business Models [15]	Strategy Business Model Framework [17]	The Core + Complement Business Model Framework [16]	Dynamic Business Model Framework for Emerging Mobile Services [14]
×		Value Chain orientation	×		×		
×	×	Cooperation strategy, relationship and dependency identification	×	×	×		×
×		Multi-tier service provision	×				
×		Complexity, scalability and risk considerations			×	×	
×		Completeness of entities regarded					
×		Model provision					
×		Quality and reliability considerations					
×	×	Products/services definition		×			×
×	×	Infrastructure considerations	×	×		×	×
×	×	Financial aspects	×	×	×	×	×
×		Business strategy orientation	×		×	×	

Table 3: Evaluation of existing business modelling frameworks

Table 3 shows that current business modelling frameworks focus on defining products or services, infrastructure, relationships within the business environment, or financial aspects. It also outlines that requirements for Mobile Grid business modelling frameworks such as multi-tier service provision, complexity, clear value chain orientation and product/service definitions can not clearly be recognized while the completeness of entities along the value chain, model provision as well as quality and reliability considerations do not seem to be regarded at all.

3.5. Conclusion

As it was already mentioned in section 2 the selection and realization of competitive strategies is a main challenge for enterprises and for this reason a clear requirement for their business modelling frameworks. As described in section 3.2 cost leadership and differentiation are two kinds of strategies that are appropriate for providers in the context of Mobile Grid services, too. The decision which strategy should be implemented is not trivial because of the amount of characteristics and application fields of the services. In section 3.3.2.1 "complexity", "domain abstraction", and specificity are provided as three classification types. Obviously, the more generic services are (low complexity and low relation to a specific domain) the cost leadership strategy seems to be applicable. Financial benefits can be achieved by realizing economies of scale or learning curve effects. In contrary to this, the more complex a service is the more promising is the differentiation strategy. Therefore, higher prices can be realized by offering high-quality services that are specifically provided for a particular field of applications.

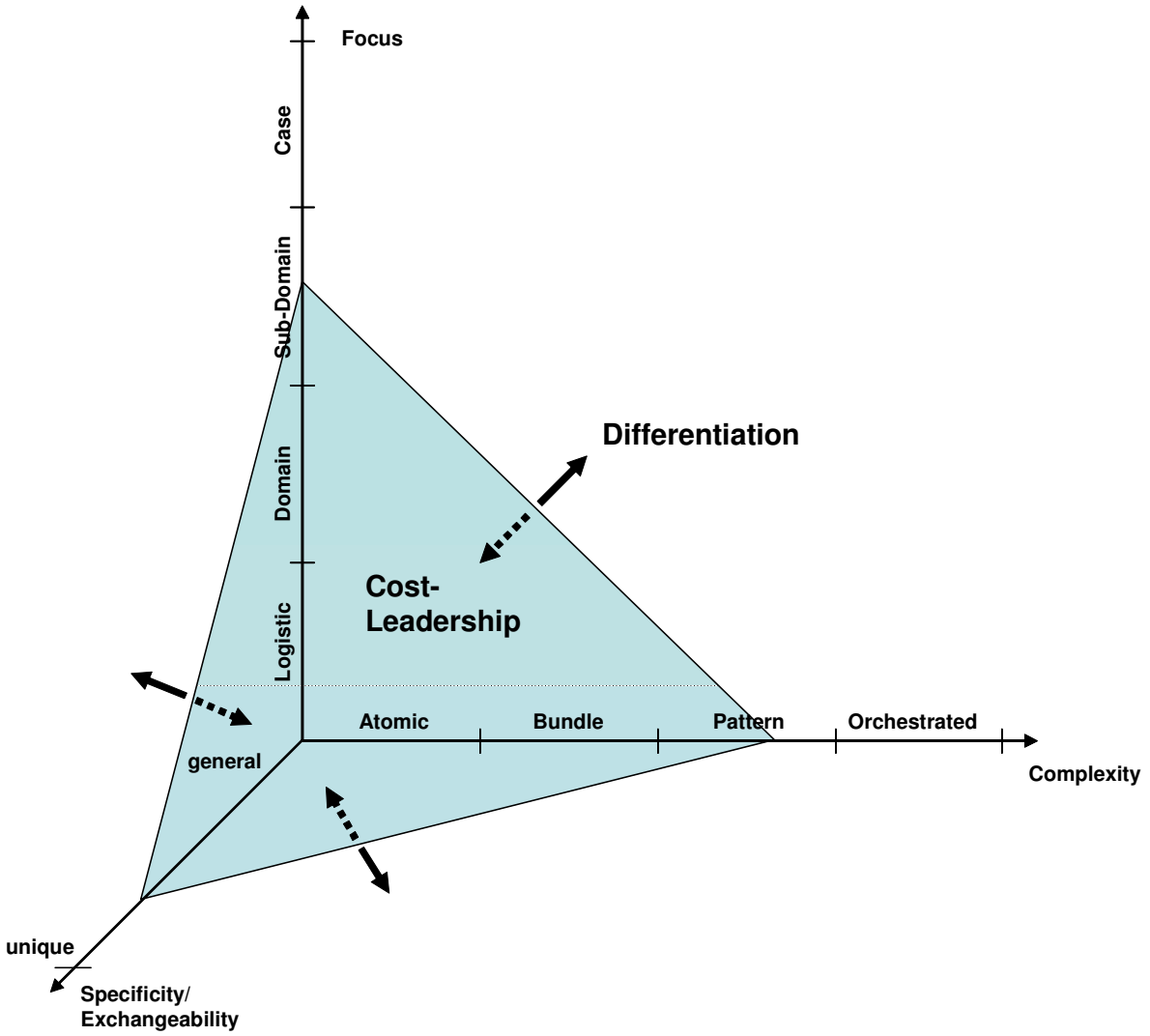

Figure 7 Selecting competitive strategies for service providers

In Figure 7 we illustrate the strategy selection depending on complexity, domain abstraction, and exchangeability. Recapitulatory, the cost leadership strategy is proposed for services located rather beneath the hatched plane. Services which are classified into the area above the plane should rather be provided by following a differentiation strategy.

In section 3.4 existing business modelling frameworks were examined regarding whether they apply to Akogrimo's requirements for business modelling frameworks. Those were mainly introduced in the beginning of section 3 and in the beginning of section 3.4. It has to be stated that none of the existing frameworks is totally compliant with Akogrimo's requirements. Consequently, a very innovative approach will be developed in this deliverable. As already outlined there are some pillars in order to provide a framework that goes along with all requirements (Table 4).

Pillar	Requirement
Value chain (cf. D3.2.1 and section 3.1) and consequently process logic orientation	• Value Chain orientation • Cooperation strategy, relationship and dependency identification
Supply chain and logistics considerations (cf. section 3.3.1)	• Cooperation strategy, relationship and dependency identification • Multi-tier service provision
Complexity considerations (cf. section 3.3.2.1.1)	• Complexity, scalability and risk considerations
Service orientation (cf. section 3.3.2)	• Complexity, scalability and risk considerations • Completeness of entities regarded • Quality and reliability considerations • Products/services definition • Infrastructure considerations • Financial aspects
Model provision (cf. sections 3.3.1, 3.3.2.2, 4.1, 5.1)	• Model provision
Business strategy statements (cf. sections 4.4, 5.4, 6)	• Business strategy orientation

Table 4: Akogrimo's Business Modelling Framework Pillars and their basic requirements

Starting from the main pillars of the Akogrimo Business Modelling Framework a process logic approach for the use of the framework can be provided:

1. Customer processes as well as derived business processes from a information, material, and cash flow logistics viewpoint are modelled (cf. sections 4.1 and 5.1).
2. Value chain participants in the sense of actors in Mobile Grid supply chains and their relationships are represented in a specific supply chain model (cf sections 4.2 and 5.2)).
3. Domain-specific services provided by each of the actors are identified and described according to a detailed service description schema. The schema focuses among others on quality and reliability, service results, service environments (infrastructures), and financials. Finally the complexity, domain orientation, and specificity of each service is considered on the basis of its underlying logistics services (cf. sections 3.3.2.1, 4.3, and 5.3).
4. For each generic Mobile grid services value chain participant a certain business strategy is proposed in a preliminary way (cf. sections 4.4 and 5.4).

4. Business-Oriented Description of the Emergency Scenario

In the following sections, the emergency scenario is further analyzed and theoretical concepts are applied. This includes a description of the emergency scenario process from different viewpoints (section 4.1), of the participants in the scenario (section 4.2), as well as of the services used by the different process steps in the scenario and provided as well as consumed respectively by its different participants (section 4.3). In the ideal case, regarding the whole landscape of process steps, participants, and services provided, in section 4.4 the participants' business strategies are proposed including their motivating aspects.[11]

4.1. Process Perspective

In this section the emergency scenario is described from different viewpoints. As Mobile Grid services mainly process information an information logistics view is introduced (section 4.1.1). Nevertheless material logistics as well as cash flows and their peripheral processes are considered in sections 4.1.2 and 4.1.3 respectively. Especially cash flows and financial aspects have still to be discussed in more detail for the needs of providing Mobile Grid services.

4.1.1. Information Logistics Perspective

The information logistics view starts from the customer process vertically given on the left side of Figure 8. In the emergency case the customer represents a person equipped with a device for continuous heart monitoring. After he has been registered as a user, his electro-cardiogram is continuously recorded, transmitted, and analyzed in the Grid infrastructure. In the case of irregularities an emergency call is launched. While the patient is waiting for first aid, he has the chance to talk to the emergency centre. After the emergency car arrives he can be brought to hospital according to the doctor's diagnosis. After his hospital stay he will pay for the services received.

On the right side of Figure 8 some supporting information logistics processes are shown. As the patient does not care about how he will be rescued but simply has a certain idea of getting a complete service with an adequate quality level, the supporting services are clearly aligned with the customer process. Furthermore they base on the special capabilities of the Mobile Grid.

For each of the linkages of the different process steps is shown which information is necessary in order to execute the process step. Furthermore, the information logistics-oriented services supporting the different process steps are shown in the white boxes attached to most of the grey process steps. These supporting services are described in detail in section 4.3.

[11] This was not be performed in this deliverable. The author's appraisal of business strategies was available before the methodological approach in sections 4.1 to 4.3.

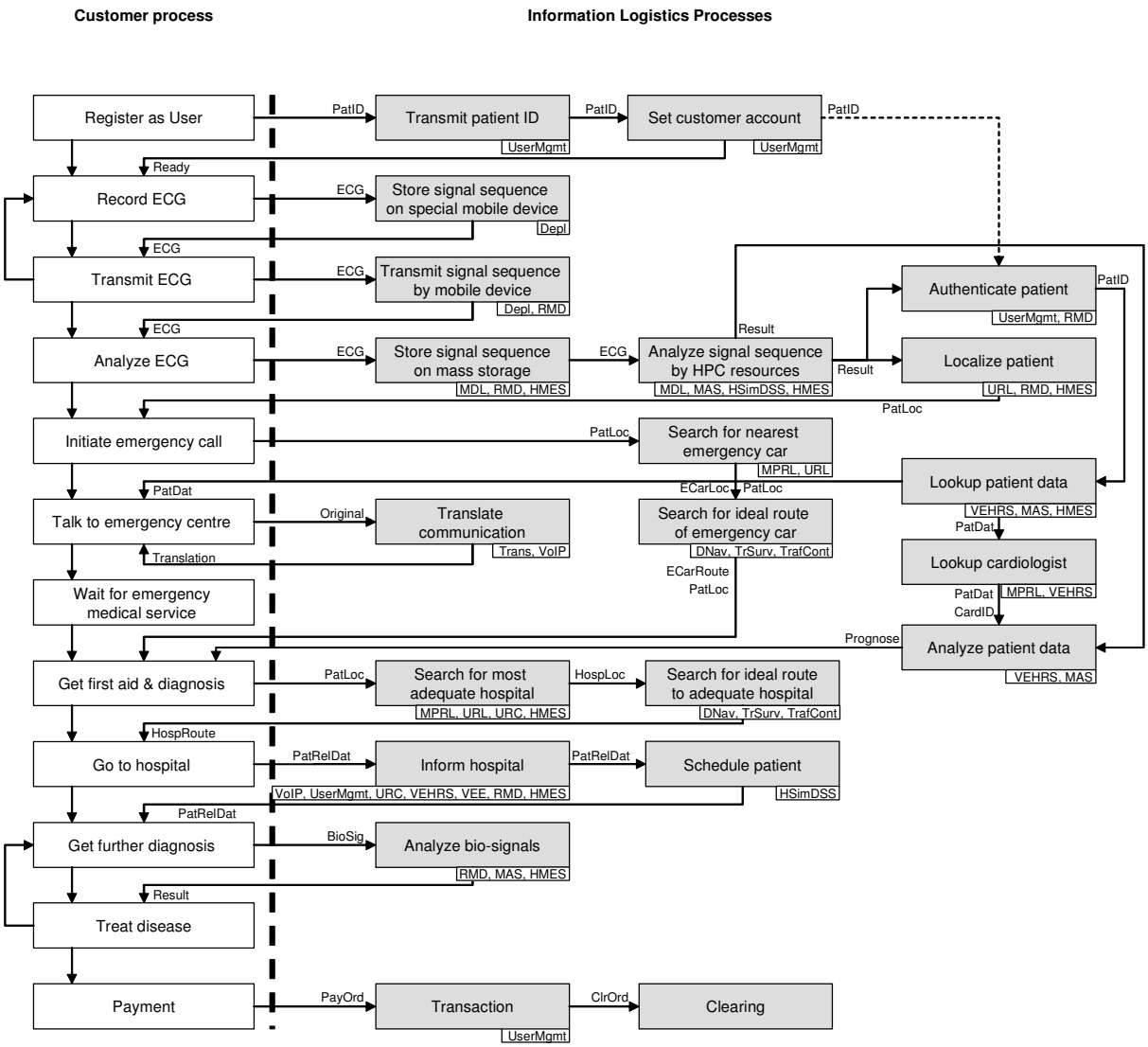

Figure 8 Process logic of the Akogrimo emergency scenario from an information logistics viewpoint[12]

4.1.2. Material Logistics Perspective

According to the information logistics view in section 4.1.1 Figure 9 outlines the material flows before (dashed lines and boxes) and during the emergency process. Before any patient can be

[12] *Caption of the services used in the figure:* **Deploy** … Deployment Service; **VoiP** … VoIP Service; **Trans** … Translation Service; **MDL** … Medical Data Logger Service Description; **UserMgmt** … User Management/Profile Management Service; **EHUP** … E-Health User Portal Service; **MPRL** … Medical Personnel and Resource Locator Service; **URL** … User/Resource Location Service; **Dnav** … Dynamic Navigation Service; **TrSurv** … Traffic Surveillance Service; **URC** … User/Resource Context Service; **TrafCont** … Traffic Control Service; **VEHRS** … Virtual Emergency Health Record Service; **VEE** … Virtual Emergency Environment; **RMD** … Remote Medical Device Service; **MAS** … Medical Analysis Service; **HSimDSS** … Health Simulation and Diagnosis Support Service; **HMES** … Heart Monitoring and Emergency Service; *caption of the information transferred:* **BioSig** … Bio signal; **CardID** … Cardiologist identification; **ClrOrd** … Clearing Order; **ECarLoc** … Emergency car's location; **ECG** … electro-cardiogram; **HospLoc** … Hospital's location; **HospRoute** … Route to Hospital; **PatDat** … Patient Data; **PatID** … Patient identification; **PatLoc** … Patient's location; **PatRelDat** … Patient-related data; **PayOrd** … Payment order.

registered it has to be assured that the network and the Grid infrastructure are well prepared. Furthermore, it is necessary that the domain specific solutions as well as contents are available. Last not least access and payment services have to be in place in order to manage and balance possible accounts.

Unlike the information logistics view in Figure 9 no supporting services are given as the Mobile Grid focuses on information and knowledge processing, while devices as well as other goods are delivered via conventional business collaboration infrastructures as can be seen in deliverable D3.2.1, but which are not furthermore considered in this deliverable. For this reason only the physical and physically bound resources are mentioned in the context of the edges.

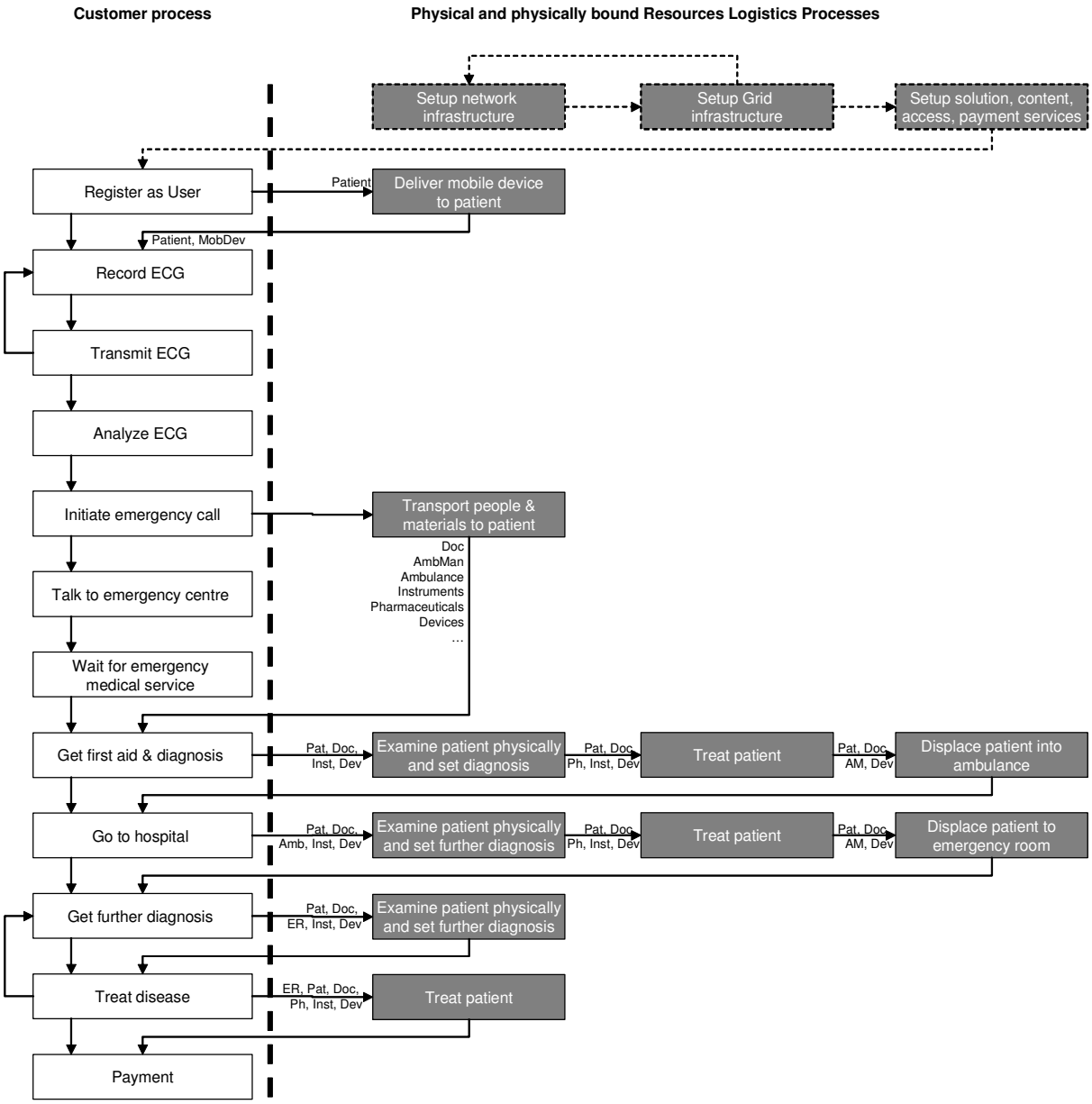

Figure 9 Process logic of the Akogrimo emergency scenario from a material logistics viewpoint[13]

4.1.3. Cash Flow and Peripheral Processes Perspective

In order to have a complete view of the different flows in the context of the emergency scenario, it is necessary to have an overview of cash flows and their peripheral processes. For this reason Figure 10 shows how a patient's account is charged along his customer process and how the invoice is paid and the clearing process works from a very principle point of view. In this deliverable, cash flows their peripheral processes are not furthermore deepened as they have to

[13] *Caption of the physical resources mentioned in the figure:* **AmbMan** … Ambulance man; **Dev** … Devices; **Doc** … doctor; **Inst** … Instruments; **ER** … Examination Result; **MobDev** … Mobile device; **Pat** … Patient; **Ph** … Pharmaceuticals.

be aligned with the challenges of "Grid commerce" which depends on technical issues that have to be clarified in the further development of the project.

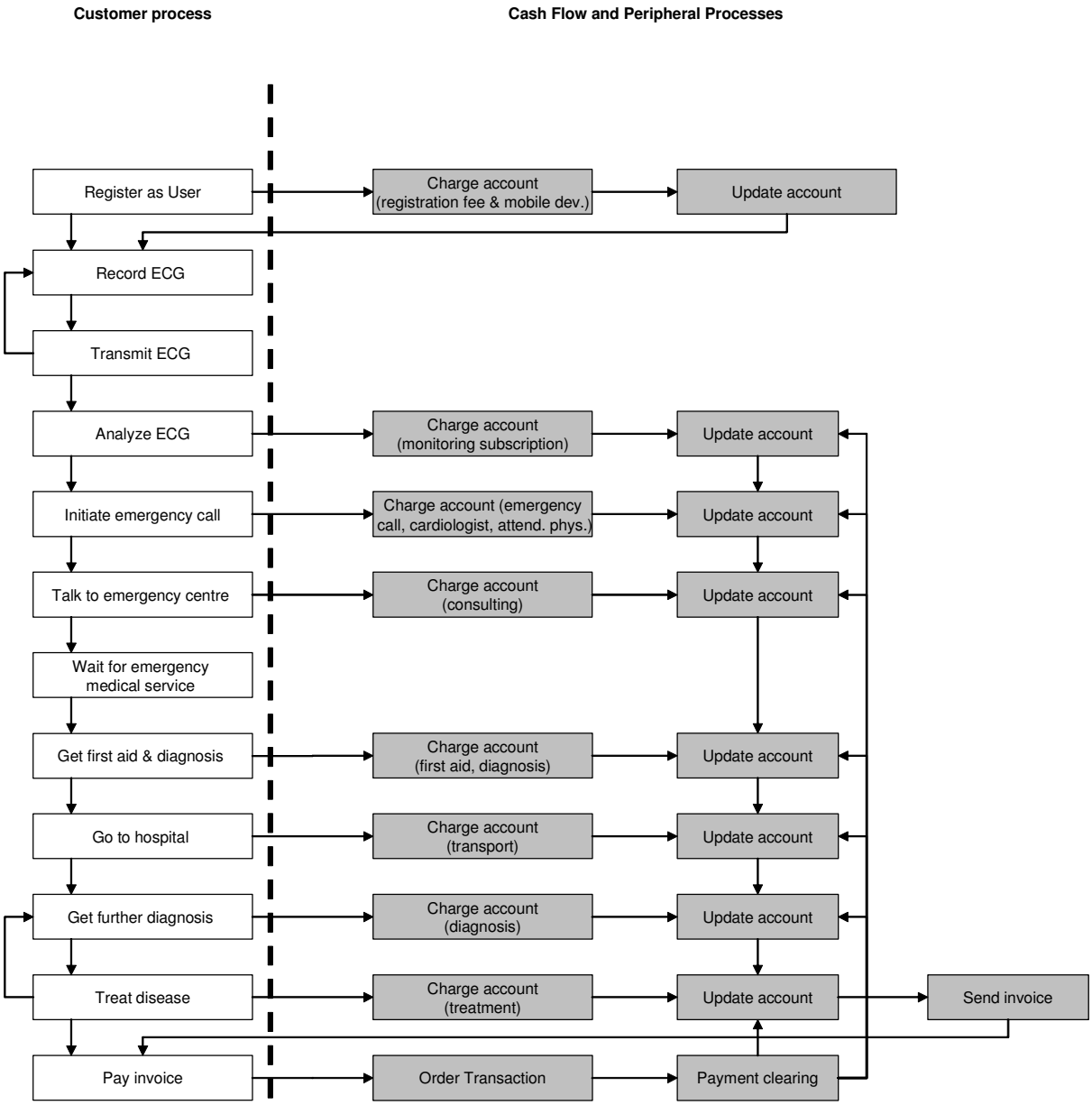

Figure 10 Process logic of the Akogrimo emergency scenario from a cash flow and its peripheral processes viewpoint

4.2. Participants in the Emergency Scenario

This section provides an overview of those participants in the respective value network for the emergency scenario as structured and denoted in D3.2.1 ("The Akogrimo Consolidated Value Chain"). According to the scenario analysis performed in D3.2.1, these participants embrace the respective groups of generic and scenario-specific participants as they are shown in Table 5.

Generic Participants	Scenario-Specific Adaptation of Participants
Access Provider	Access Provider

Generic Participants	Scenario-Specific Adaptation of Participants
Content Provider	Emergency Car Locator Evidence- & Experience-based Medicine Information Provider Hospital Locator
Device Provider	Mobile Phone Seller
Grid Equipment Provider	Grid Equipment Provider
Grid Operator	Network Operator
Grid Resource Provider	Network Operator Health Service Provider Patient Storage Provider
Grid Solution Provider	Communications Provider Location Provider Translation Provider Trust Provider Cryptography Service Provider
Local Resource Provider	Patient as ECG Data Provider Heart Attack Specialist (Doctor) as knowledge provider Hospital
Logistics Service Provider	Emergency Car Provider Heart Attack Specialist (Doctor) Hospital
Network Equipment Provider	Network Equipment Provider
Network Operator	Network Operator
Network Service Provider	Network Operator
Payment Clearing Provider	Payment Clearing Provider
Payment Provider	Health Service Provider Network Operator
Plug-In Equipment Provider	Communication Software Provider Bio-Signal Software Provider
Solution Provider	Health Service Provider

Table 5 Generic and scenario-specific participants in the emergency scenario

In addition to those generic participants that have been identified in D3.2.1, the introduced supply chain and logistics perspective in section 3.3 alters participants' ranges by including Logistics Service Providers that focus on non-electronic services. In order to keep a consistent view on the value network presented in D3.2.1, Logistics Service Providers should be incorporated into the respective value network group of distribution channels.

Participants in the Supply Chain

Figure 11 provides a supply chain model for those participants identified and described in Table 5. The actor model visualizes an instantiation of the generic supply chain model depicted in Figure 3 with its basic elements, namely customers, configurators, vendors, producers, suppliers and logistics service providers.

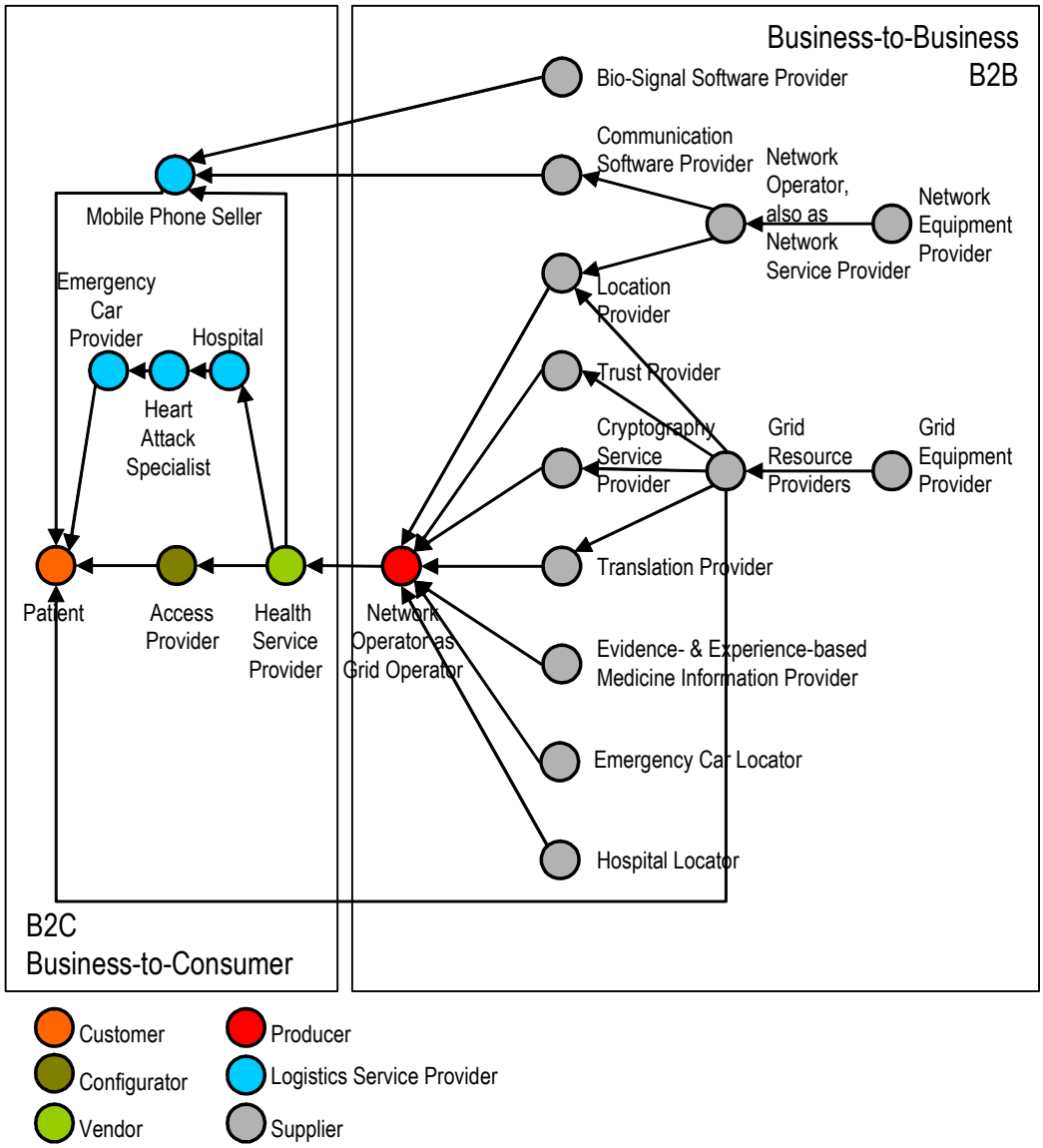

Figure 11 Supply chain model for the emergency scenario[14]

For reasons of clarity, Figure 11 does not show Payment or Payment Clearing Providers that are not furthermore considered in this deliverable nor is network access through a Network Operator explicitly reflected for any participant.

4.3. Services in the Emergency Scenario

In the following sections a set of services for the emergency scenario is proposed. In the first step they are assigned to service providers and services receivers according to the generic and scenario-specific participants introduced in section 4.2. The detailed description of the scenarios

[14] The arrows represent flows of information and goods that are outlined in the process models in section 4.1. Particularly for information logistics processes in section 4.1.1 that are quite dominant in the area of Mobile Grid services information flows and corresponding services are brought together. For the latter ones there is an assignment of service providers and service consumers given in the detailed service descriptions in annex A.1. Cash flows normally are oriented against information and material flows.

according to the schema in section 3.3.2.2 can be found in annex A.1. In this way it is possible to meet Akogrimo's requirements for business modelling as outlined in section 3.5 in a very flexible way.

4.3.1. Services and Service Providers

In Table 6 an overview of the different services in the emergency scenario and their providers as well as receivers is presented. The services are described in detail in annex A.1.

Generic Participants → / Scenario-specific Participants → / Scenario-focused, complex Services ↓	Access Provider	Content Provider			Grid Operator	Grid Resource Provider	Grid Solution Provider					Local Resource Provider	Logistics Service Provider			Solution Provider	User
	Access Provider	Emergency Car Locator	Evidence & Experience-based Med. Inf. Prov.	Hospital Locator	Network Operator	Patient Storage Provider	Communications Provider	Cryptography Service Provider	Location Provider	Translation Service Provider	Trust Provider	Patient as ECG Data Provider	Emergency Car Provider	Heart Attack Specialist	Hospital	Health Service Provider	Patient
Deployment Service	P																R
VoIP Service							P						R	R	R		R
Translation Service										P				R	R		
Medical Data Logger Service Description						P						P		R	R		R
User Management/Profile Management Service																P	R
E-Health User Portal Service																P	R
Medical Personnel and Resource Locator Service		P		P									R	R	R		
User/Resource Location Service									P							R	
Dynamic Navigation Service									P							R	
Traffic Surveillance Service		P														R	
User/Resource Context Service		P	P	P		P							R	R	R	R	
Traffic Control Service		P											R	R	R		
Virtual Emergency Health Record Service						P								R	R		
Virtual Emergency Environment														R	R	P	R
Remote Medical Device Service		P	P	P	R	P	P	P	P	P	P		P R	P R	P R	R	R
Medical Analysis Service																P	R
Health Simulation and Diagnosis Support Service													R	R	R	P	R
Heart Monitoring and Emergency Service	P												R	R	R		R

Table 6 Services and service providers/receivers in the emergency scenario[15]

Considering the participants, only such participants are mentioned that work as service providers or service receivers regarding the services mentioned.

[15] Captions: **P/red** … Service Provider; **R/green** … Service Receiver.

4.3.2. Service Analysis from the Generic Logistics Perspective

In Table 7 the services mentioned in section 4.3.1 and described in detail in annex A.1 are analyzed regarding of which basic logistic services they are built. Performing this analysis serves to get more general insights in service construction for service providers in the Akogrimo Value Network.

	Focus		Executing Logistic Services					Planning and Optimizing Logistic Services											
	Material	Information	Transport	Storing	Transaction of Sort	Transaction of Amount	Production	Routing	Scheduling	Capacity Determination	Demand Analysis	ABC/XYZ Analysis	Tracking and Tracing	Optimization of Locations	Optimization of Capacities	Runtime Controlling	Accountancy	Retrieving	Localization
Deployment Service		×	×	×	×			×		×			×		×	×	×		
VoIP Service		×	×					×				×			×	×	×		
Translation Service		×					×				×						×		
Medical Data Logger Service Description		×		×							×				×	×		×	
User Management/ Profile Management Service		×			×						×					×	×		
E-Health User Portal Service		×														×	×		
Medical Personnel and Resource Locator Service		×									×							×	
User/Resource Location Service	×	×		×														×	×
Dynamic Navigation Service		×						×					×						×
Traffic Surveillance Service		×						×		×	×	×	×	×	×	×			
User/Resource Context Service		×								×		×							
Traffic Control Service		×						×			×	×			×				
Virtual Emergency Health Record Service		×			×	×					×	×						×	
Virtual Emergency Environment		×	×	×				×			×	×				×	×	×	
Remote Medical Device Service		×									×							×	
Medical Analysis Service		×			×		×									×			
Health Simulation and Diagnosis Support Service		×			×		×									×			
Heart Monitoring and Emergency Service	×	×	×	×	×	×	×	×	×	×	×	×	×		×	×	×	×	×

Table 7 Analysis of emergency-specific services by means of generic logistics services[16]

[16] The Executing Logistic Services as well as the Planning and Optimizing Logistic Services are described in section 3.3.2.1.1.

4.4. Participants' Economic Strategies

Structured in the same way as in Table 5, for each generic participant subsequently either differentiation or cost leadership strategy is identified and motivated.

Participant	Competitive Strategy[17]	Motivation
Access Provider	Cost Leadership	Implementing technology-transparent network and resource usage for authenticated and authorized users, is not regarded to be accomplished easily. Nevertheless, scalability issues and cost-efficient operation of the respective authentication and authorization infrastructure outweigh differentiation potentials so that cost leadership is chosen as competitive strategy.
Content Provider	Differentiation	Like in the case of Grid Resource Providers, the chosen competitive strategy depends on how unique offered content is for a Grid-based service. Since Akogrimo engages in complex problem solving, content most likely is targeted to be included into knowledge-intensive workflows, which are tailored to application domain-specific solutions, such as e-health. For example, if a provider is able to offer access to evidence- and experience-based medical information, this service is not easy to be copied, since it is a time- and cost-intensive task to gain knowledge in this area. Therefore, content is to be regarded as being equipped with a high potential for differentiation by means of its uniqueness.
Device Provider	Differentiation	A Device Provider's main task consists in enhancing a mobile device by software plug-ins and by hardware extensions, such as sensors, that are customized to a concrete mobile Grid solution. Device Providers in a mobile grid environment thus are not seen as pure mobile phone resellers, even though selling activities are regarded as one of their core competences. Particularly on the hardware side, proprietary enhancements have to be considered and integrated into a working environment, meeting the respective requirements that are set by a Device Provider's customer. This implies high development costs, offers however a high value on the customer's side so that a differentiation strategy is adopted.
Grid Equipment Provider	Cost Leadership	Grid Equipment Providers, follow a strategy of cost leadership since they are regarded as suppliers of mostly standardized, easily imitable equipment. Only for emerging technology, first movers are able to offer unique solutions to their customers.

[17] According to section 3.2.

Participant	Competitive Strategy[17]	Motivation
Grid Operator	Differentiation	While ongoing Grid platform operation is mainly determined by cost efficiency optimization criteria (leading to a cost leadership strategy), the close relationship to Solution Providers in configuring and consulting as well as being able to combine basic to complex Grid services justify both a competitive strategy of differentiation.
Grid Resource Provider	Cost Leadership	Grid Resource Providers are interested in offering their specific services and/or resources in as many virtual organizations as possible. They are concerned with the most efficient way of service provision, what leads to a cost leadership strategy. Only if a resource or a service is regarded to be unique and not easily to be supplied by a competitor, a differentiation strategy is recommended. For instance, a provider of patient record storage might offer the very same service to another VO. However, since this service is specific to hospitals only, the service logic itself will be taken for a similar service, but the service will be otherwise configured, e.g. in order to locate museums or restaurants.
Grid Solution Provider	Cost Leadership	Taking into account single grid solutions only, such as messaging or localization services, hardly suffices to offer a unique product to customers, so that differentiation in the first place would not be a viable strategy. Single Grid solutions are standardized and mainly interoperable with competitors' solutions (e.g. SMS, Short Messaging Service). A communications provider for instance has to interconnect its services with competitors' communication infrastructure. Despite that, being able to offer for instance to a Grid Operator a complete bundle of Grid solutions (such as trust, location, and communication services) allows e.g. a Mobile Operator to differentiate from competitors. Under these circumstances, a Network Operator can adopt a differentiation strategy.
Local Resource Provider	Cost Leadership	Offering local resources, that are available to others outside the own administrational domain in order to perform tasks, but without knowing details about the job itself, is highly unspecific. Thus a cost leadership strategy is indicated.
Logistics Service Provider	Cost Leadership	Even though a hospital or heart attack specialist offers a personalized and high-value service to its customers, these services are still to be regarded as being standardized to a high degree. This means that – despite the assumption of varying professional competence – different doctors achieve similar results when treating a patient. Therefore, optimal attribution of existing resources lies in a logistics service provider's interest so that cost leadership is taken up as competitive strategy.

Participant	Competitive Strategy[17]	Motivation
Network Equipment Provider	Cost Leadership	Network Equipment Providers, follow a strategy of cost leadership since they are regarded as suppliers of mostly standardized, easily imitable equipment. Only for emerging technology, first movers are able to offer unique solutions to their customers.
Network Operator	Cost Leadership	A pure-play Network Operator that deals with rolling out and maintaining a communications network only, cannot produce a well differentiated product for its customer base. Accordingly, cost leadership is chosen as competitive strategy since network operation mainly is concerned with supply of a reliable and cost-efficient communications infrastructure. If a Network Operator however also runs the Akogrimo platform, its role turns to a Network and Grid Operator where a higher potential for differentiation is gained.
Network Service Provider	Cost Leadership	A Network Service Provider sells bandwidth to its customers which mainly consist of Grid Resource Providers. This is regarded as a low-value, easily imitable task, that includes high efforts in cost optimization. Thus, a cost leadership strategy is indicated.
Payment Clearing Provider	Cost Leadership	In the same way as for Access Providers, Payment Clearing Providers focus on a highly scalable and reliable infrastructure, whereas the offered product itself is completely standardized, what leads to a cost leadership strategy.
Payment Provider	Cost Leadership	In the same way as for Access Providers, Payment Providers focus on a highly scalable and reliable infrastructure, whereas the offered product itself is completely standardized, what leads to a cost leadership strategy.
Plug-in Equipment Provider	Differentiation	Even though Plug-in Equipment Providers are last-tier suppliers like Grid and Network Equipment Providers, their products are highly customized to a specific solution, which requires application domain-specific knowledge that is not easily gained. Therefore, a differentiation strategy is advised. Products include software components, e.g. for bio-signal transfer, that are incorporated into a mobile device by Device Providers.
Solution Provider	Differentiation	Solution Providers, such as a health service provider, are regarded as the value network participants with one of the highest potential for differentiation, since they form a central element in a Mobile Dynamic Virtual Organization, disposing of a complete view of the whole organization. Solution providers initiate, compose, and manage offered services, and organizational resources are coordinated. Thus, a solution provider acts as an aggregator towards end users, which results in a complex and domain-specific product.

Table 8 Competitive strategies for the generic participants in the emergency scenario

4.5. Conclusion

The emergency scenario customer process is supported by information, material logistic and cash flow processes. Each of these processes has high interdependencies, so they have to be supported by scenario-specific services with different degrees of domain-specificity, complexity as well as exchangeability. These services were concretely identified and described in detail in the area of information logistic processes that are most interesting for Mobile Grid service value chains. The analysis of the services from a logistics perspective outlined that most of the services are built of numerous generic logistic services. This can be understood as an indicator that most of the services are quite complex. Furthermore it can be stated that the more complex the services are the more they are domain-specific. Finally the more complex services are the more participants in the Mobile Grid value chain have to invest on them (specificity).

Such considerations lead to the overall judgement of the business strategy for each of the participants performing the above mentioned services in the emergency scenario. In order to be comparable to other scenarios and to derive general conclusions the scenario-specific participants are directly aggregated towards the generic Mobile Grid value chain participants. In Table 9 the generic roles are further aggregated. It seems to be obvious that in the emergency scenario network technology providers, access, payment, and logistics providers should follow cost leadership strategies while content and solution providers that are rather customer-oriented should perform differentiated services. Grid technology providers and providers of extended mobile device infrastructures should follow context-dependent strategies.

		E-Health Scenario
Network Technology Provision	Network Equipment Provider	CLS
	Network Operator	CLS
	Network Service Provider	CLS
Grid Technology Provision	Grid Equipment Provider	CLS
	Grid Solution Provider	CLS
	Grid Resource Provider	CLS
	Grid Operator	DFS
Content Provision	Content Provider	DFS
Solution Provision	Solution Provider	DFS
Access Provision	Access Provider	CLS
Extended Mobile Device Infrastructure Provision	Plug-in Equipment Provider	DFS
	Device Provider	DFS
	Local Resource Provider	CLS
Payment Provision	Payment Clearing Provider	CLS
	Payment Provider	CLS
Logistics Provision	Logistics Service Provider	CLS

Table 9 Strategic proposals for generic roles in the emergency scenario[18]

[18] Caption of abbreviations and coloured fields: **CLS/blue** … Cost Leadership Strategy; **CDS/green** … Context-Dependent Strategy; **DFS/yellow** … Differentiation Strategy.

5. Business-Oriented Description of the E-Learning Scenario

In the following sections, the e-learning scenario is further analyzed and theoretical concepts are applied. This includes a description of the emergency scenario process from different viewpoints (section 5.1), of the participants in the scenario (section 5.2), as well as of the services used by the different process steps in the scenario and provided as well as consumed respectively by its different participants (section 5.3). In the ideal case, regarding the whole map of process steps, participants, and services provided, in section 5.4 the participants' business strategies are proposed including their motivating aspects.[19]

5.1. Process Perspective

In this section the e-learning process scenario is described from different viewpoints. As Mobile Grid services mainly work information an information logistics view is introduced (section 5.1.1). Nevertheless material logistics as well as cash flows and their peripheral process are considered in sections 5.1.2 and 5.1.3 respectively. Especially cash flows and financial aspects have still to be discussed in more detail for the needs of providing Mobile Grid services.

5.1.1. Information Logistics Perspective

The information logistics view starts from the customer process vertically given on the left side of Figure 12. In the e-learning case the customer represents a person equipped with a device for a students' field trip. After he has been registered as a user, he gets a task based on which searches and studies are performed. The experiences will be shared with other groups. After the student logged-in in the Greece system he is able to collect information on field and to arrange its presentation. On this basis he can run a 3D simulation. If he has to change his terminal he can keep his session running. At the end of his work he consults certain digital libraries in order to get more detailed information. Finally his work will be evaluated and the usage of the Mobile Grid services has to be paid.

On the right side of Figure 12 some supporting information logistics processes are shown. As the student does not care about how he will solve his tasks but simply has a certain idea of getting a complete service with an adequate quality level, the supporting services are clearly aligned with the customer process. Furthermore they base on the special capabilities of the Mobile Grid.

For each of the linkages of the different process steps is shown which information is necessary in order to execute the process step. Furthermore the information logistics-oriented services supporting the different process steps are shown in the white boxes attached to most of the grey process steps. These supporting services are described in detail in section 5.3.

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[19] This was not be performed in this deliverable. The author's appraisal of business strategies was available before the methodological approach in sections 5.1 to 5.3.

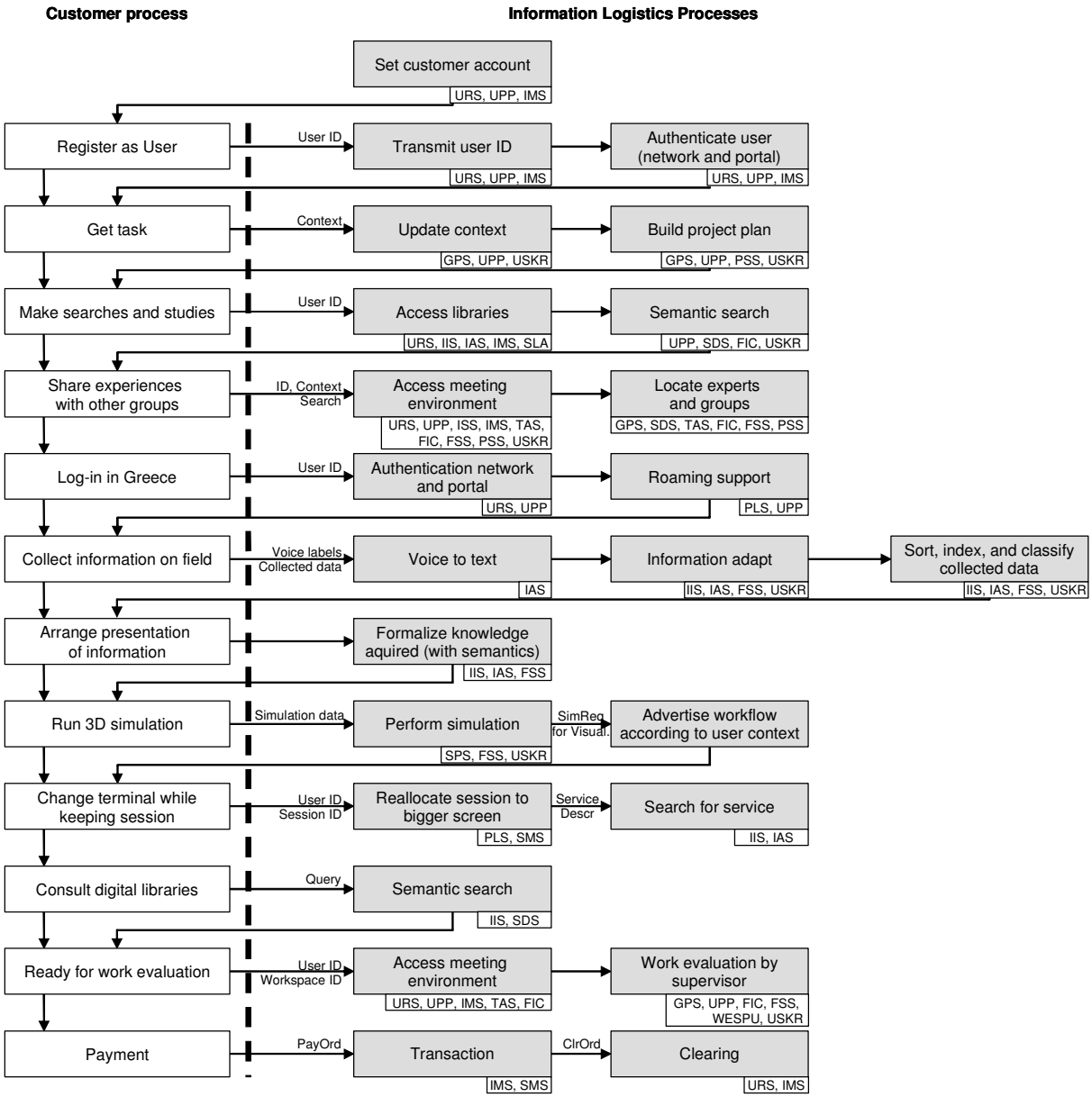

Figure 12 Process logic of the Akogrimo e-learning scenario from an information logistics viewpoint[20]

5.1.2. Material Logistics Perspective

According to the information logistics view in section 5.1.1 Figure 13 outlines the material flows before (dashed lines and boxes) and during the e-learning process. Before any student can be registered it has to be assured that the network and the Grid infrastructure are well prepared.

[20] **GPS** … Groupware Provision Service; **FIC** … Field Information Collection Service; **FSS** … Field Support Service; **IAS** … Information Adaptation Service; **IIS** … Information Indexation Service; **IMS** … Identity Management Service; **PLS** … People Location Service; **PSS** … Project Symbiosis Service; **SDS** … Service Discovery Service; **SLA** … Specialized Library Access Service; **SMS** … Session Mobility Service; **SPS** … Simulation Performing Service; **TAS** … Teaching Assistance Service; **UPP** … User Presence Provision Service; **URS** … User Registration Service; **USKR** … Universtity/Student Knowledge Reselling Service; **WESPU** … Work Evaluation and Study Plan Update Service.

Furthermore it is necessary that the domain specific solutions as well as contents are available. Last not least access and payment services have to be in place in order to manage and balance possible accounts.

Unlike the information logistics view in Figure 13 no supporting services are given as the Mobile Grid focuses on information and knowledge processing, while devices as well as other goods are delivered via conventional business collaboration infrastructures as can be seen in deliverable D3.2.1, but which are not furthermore considered in this deliverable. For this reason only the physical and physically bound resources are mentioned in the context of the edges.

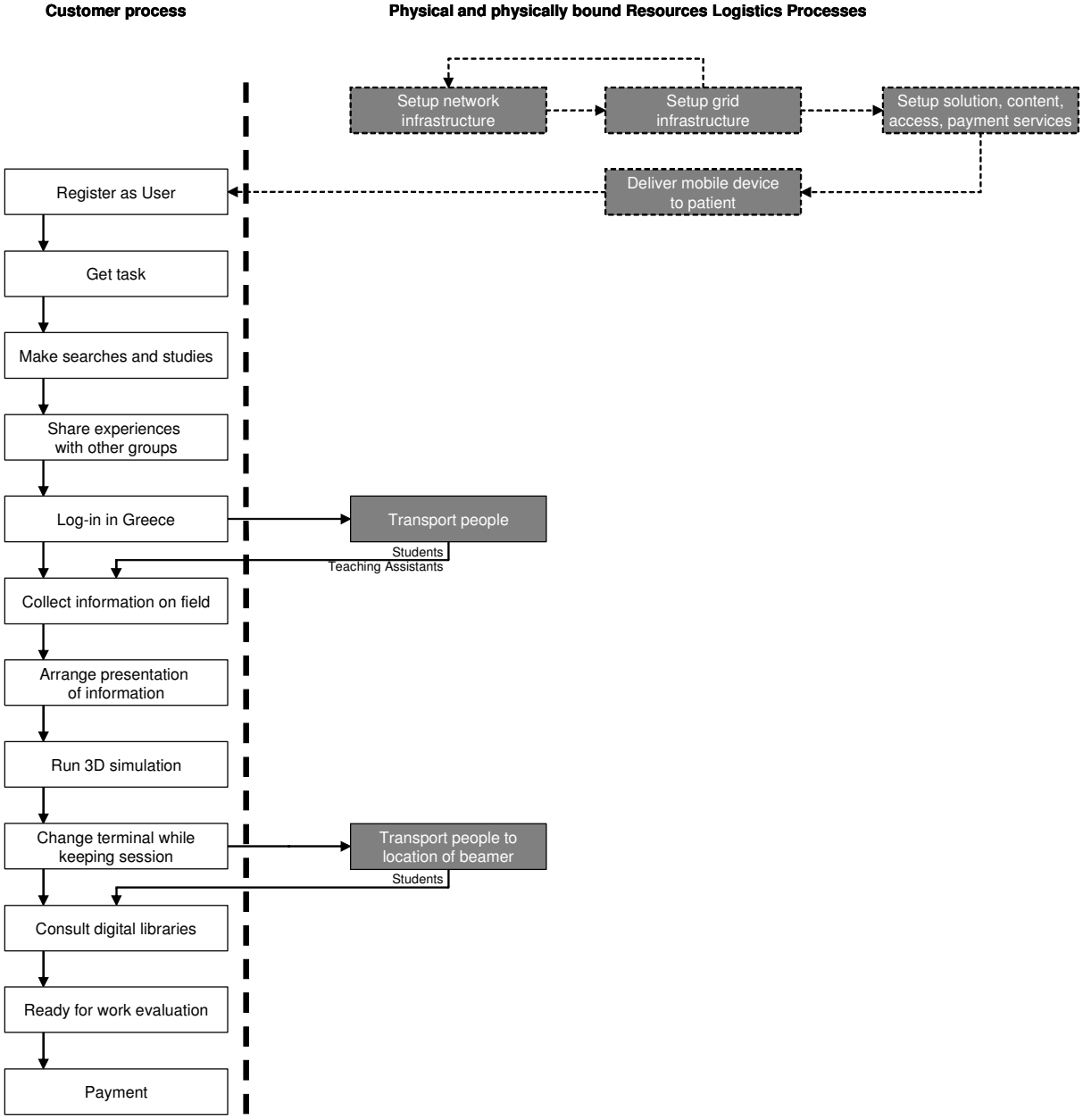

Figure 13 Process logic of the Akogrimo e-learning scenario from a material logistics viewpoint

5.1.3. Cash Flow and Peripheral Processes Perspective

In order to have a complete view of the different flows in the context of the e-learning scenario, it is necessary to have an overview of cash flows and their peripheral processes. For this reason

Figure 14 shows how a patient's account is charged along his customer process and how the invoice is paid and the clearing process works from a very principle point of view. In this deliverable cash flows and their peripheral processes are not furthermore deepened as they have to be aligned with the challenges of "Grid commerce" which depends on technical issues that have to be clarified in the further development of the project.

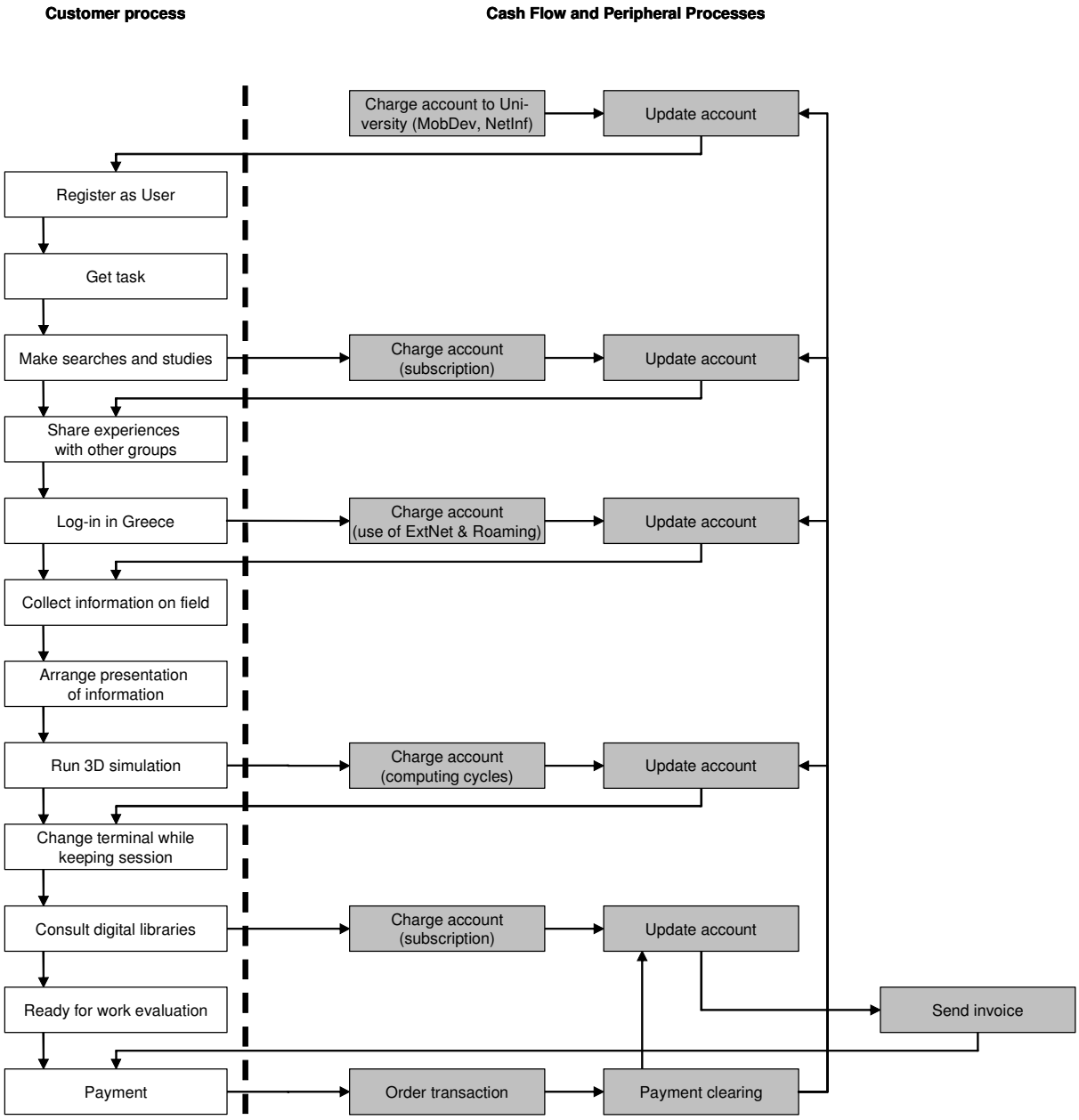

Figure 14 Process logic of the Akogrimo e-learning scenario from a cash flow and its peripheral processes viewpoint

5.2. Participants in the E-Learning Scenario

This section provides an overview of those participants in the respective value network for the e-learning scenario as structured and denoted in D3.2.1 ("The Akogrimo Consolidated Value Chain"). According to the scenario analysis performed in D3.2.1, these participants embrace the respective groups of generic and scenario-specific participants as they are shown in Table 10.

Generic Participants	Scenario-Specific Adaptation of Participants
Access Provider	Portal Provider
Content Provider	Electronic Project Studies and Researches Provider Expertise Provider Student Acquired Knowledge Reseller University Acquired Knowledge Reseller
Device Provider	Laptop Provider PDA Provider
Grid Equipment Provider	Grid Equipment Provider
Grid Operator	Grid Operator
Grid Resource Provider	Data Indexation Provider Information Retrieval Provider Grid Resource Provider Simulation Service Provider
Grid Solution Provider	E-Learning Platform Provider Groupware Provider Identity Provider Location Provider Meeting Service Provider Session Mobility Service
Logistics Service Provider	University
Network Equipment Provider	Network Equipment Provider
Network Operator	Greek POTS University LAN Provider
Network Service Provider	Greek POTS University LAN Provider
Payment Clearing Provider	Payment Clearing Provider
Payment Provider	Payment Provider
Plug-In Equipment Provider	Communication Software Provider
Solution Provider	E-Learning Platform Provider Field Trip Grid Solution Provider

Table 10 Generic and scenario-specific participants in the e-learning scenario

Participants in the Supply Chain

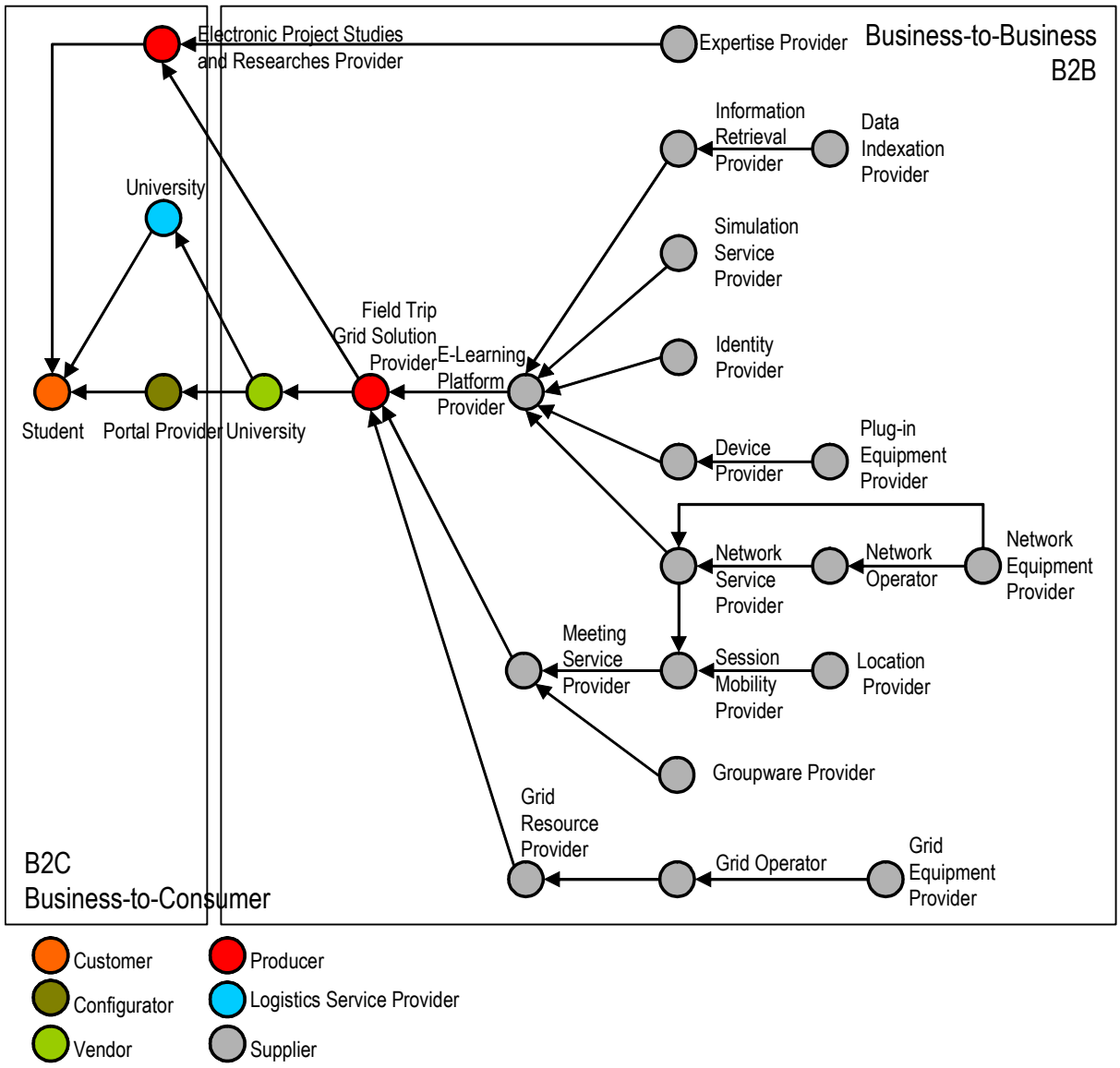

Figure 15 Supply chain model for the e-learning scenario[21]

For reasons of clarity, Figure 15 does not show Payment or Payment Clearing Providers that are not furthermore considered in this deliverable nor is network access through a Network Operator explicitly reflected for any participant.

[21] The arrows represent flows of information, goods, and financials that are outlined in the process models in section 5.1. Particularly for information logistics processes in section 5.1.1 that are quite dominant in the area of Mobile Grid services information flows and corresponding services are brought together. For the latter ones there is an assignment of service providers and service consumers given in the detailed service descriptions in annex A.2. Cash flows normally are oriented against information and material flows.

5.3. Services of the E-Learning Scenario

In the following sections a set of services for the emergency scenario is proposed. In the first step they are assigned to service providers and services receivers according to the generic and scenario-specific participants introduced in section 5.2. The detailed description of the scenarios according to the schema in section 3.3.2.2 can be found in annex A.2. In this way it is possible to meet Akogrimo's requirements for business modelling as outlined in section 3.5 in a very flexible way.

5.3.1. Services and Service Providers

In Table 11 an overview of the different services in the emergency scenario and their providers as well as receivers in presented. The services are described in detail in annex A.2.

Generic Participants → / Scenario-specific Participants → / Scenario-focused, complex Services ↓	Portal Provider (Access Provider)	E-Project Studies and Researches Provider (Content Provider)	Student Acquired Knowledge Reseller (Content Provider)	University Acquired Knowledge Reseller (Content Provider)	Laptop Provider (Device Provider)	PDA Provider (Device Provider)	Grid Operator	Data Indexation Provider (Grid Ressource Provider)	Information Retrieval Provider (Grid Ressource Provider)	Grid Ressource Provider (Information Adaptation Focus) (Grid Ressource Provider)	Simulation Service Provider (Grid Ressource Provider)	E-Learning Platform Provider (Grid Solution Provider)	Groupware Provider (Grid Solution Provider)	Identity Provider (Grid Solution Provider)	Location Provider (Grid Solution Provider)	Meeting Service Provider (Grid Solution Provider)	Session Mobility Provider (Grid Solution Provider)	University LAN Provider (Network Service Provider)	Greek POTS (Network Service Provider)	E-Learning Platform Provider (Solution Provider)	Field Trip Grid Solution Provider (Solution Provider)	Student (User)
Network Infrastructure Setup Service																		P	P	R		
Grid Infrastructure Setup Service							P													R		
Solution Setup Service												P									R	
Mobile Devices Delivery Service					P	P														R		
Groupware Provision Service													P							R		
User Registration Service	P																					R
People Location Service																P				R		
User Presence Provision Service															P					R		P
Information Indexation Service								P	R													
Information Adaptation Service										P										R		
Simulation Performing Service											P									R		
Service Discovery Service																P				R		
Identity Management Service														P						R		
Session Mobility Service																	P			R		
Collaboration Platform Service																				P	R	
E-Collaboration Plattform Service																					P	R
Teaching Assistance Service																					P	R

Generic Participants → / Scenario-specific Participants → / Scenario-focused, complex Services ↓	Access Provider		Content Provider		Device Provider		Grid Operator	Grid Ressource Provider				Grid Solution Provider						Network Service Provider		Solution Provider		User
	Portal Provider	E-Project Studies and Researches Provider	Student Acquired Knowledge Reseller	University Acquired Knowledge Reseller	Laptop Provider	PDA Provider	Grid Operator	Data Indexation Provider	Information Retrieval Provider	Grid Ressource Provider (Information Adaptation Focus)	Simulation Service Provider	E-Learning Platform Provider	Groupware Provider	Identity Provider	Location Provider	Meeting Service Provider	Session Mobility Provider	University LAN Provider	Greek POTS	E-Learning Platform Provider	Field Trip Grid Solution Provider	Student
Specialized Library Access Service		P																			R	
Field Information Collection Service		R																				P
Field Support Service																					P	R
Work Evaluation and Study Plan Update Service																					P	R
Project Symbiosis Service																					P	R	
Universtity/Student Knowledge Reselling Service		R	P	P																		P
Field Trip E-Learning Collaboration Platform Service																					P	R

Table 11 Services and service providers/receivers in the e-learning scenario

Considering the participants, only such participants are mentioned that work as service providers or service receivers regarding the services mentioned.

5.3.2. Service Analysis from the Generic Logistics Perspective

In Table 12 the services mentioned in section 5.3.1 and described in annex A.2 are analyzed regarding of which basic logistic services they are built. Performing this analysis serves to get more general insights in service construction for service providers in the Akogrimo Value Network.

	Focus		Executing Logistic Services					Planning and Optimizing Logistic Services								
	Material	Information	Transport	Storing	Transaction of Sort	Transaction of Amount	Production	Routing	Scheduling	Capacity Determination	Demand Analysis	Tracking and Tracing	Runtime Controlling	Accountancy	Retrieving	Localization
Network Infrastructure Setup Service	×		×		×				×	×						
Grid Infrastructure Setup Service	×		×		×				×	×						
Solution Setup Service		×	×	×			×		×	×					×	
Mobile Devices Delivery Service	×		×	×	×			×	×	×				×		
Groupware Provision Service		×	×		×	×							×	×	×	
User Registration Service		×	×	×	×											
People Location Service		×			×		×					×				×
User Presence Provision Service		×	×		×	×							×	×		
Information Indexation Service		×			×	×	×								×	
Information Adaptation Service		×		×	×	×	×								×	
Simulation Performing Service		×		×			×		×	×				×		
Service Discovery Service		×			×	×	×								×	
Identity Management Service		×	×	×	×										×	
Session Mobility Service		×			×			×								×
Collaboration Platform Service		×	×	×	×	×	×			×	×			×	×	
E-Collaboration Plattform Service		×	×	×	×	×	×			×	×			×	×	
Teaching Assistance Service		×			×	×			×	×	×			×	×	
Specialized Library Access Service		×	×		×					×				×	×	
Field Information Collection Service		×	×	×			×								×	
Field Support Service		×			×	×	×									
Work Evaluation and Study Plan Update Service		×		×	×		×				×					
Project Symbiosis Service		×	×	×	×	×	×		×							
Universtity/Student Knowledge Reselling Service		×	×	×	×	×								×		×
FT E-Learning Collaboration Platform Service		×	×	×	×	×	×			×				×		

Table 12 Analysis of e-learning-specific services by means of generic logistics services[22]

5.4. Participants' Economic Strategies

Structured in the same way as in Table 10, for each generic participant subsequently either differentiation or cost leadership strategy is identified and motivated.

[22] The Executing Logistic Services as well as the Planning and Optimizing Logistic Services are described in section 3.3.2.1.1.

Participant	Competitive Strategy[23]	Motivation
Access Provider	Differentiation	The *Portal Provider* as a scenario-specific participant follows a differentiation strategy because of several reasons. First of all, the Portal Provider would be pushed by the owner of the Field Trip Grid Solution Provider as the Portal to be used as a first preference for the clients. However, other portals provided by other parties can also enter the scene by assuring first-class services such as premium security, easier access, and so forth. Several types of differentiation are possible. In the case of a portal really offering more security services or easier access it would be a clear product differentiation. It could also happen that the customer gets a sensation of security, through the power of marketing, which does not reflect the underlying truth; in that case we would be focusing on the supply chain differentiation. Probably, the first scenario is the most realistic one.
Content Provider	Mainly Differentiation	The academic content is the basis of knowledge on top of which field trip e-learning services are built. This is a prerequisite for the success of the final product as a whole. Therefore scenario-specific *Electronic Project Studies and Researches Providers* will base their businesses in a mass differentiation of their products. Identifying and being able to reach the best and most suitable expertise for each situation is essential for the good understanding, learning and knowledge development of the student. For this reason the availability of good *Expertise Providers* as scenario-specific participants becomes mandatory. They clearly follow a differentiation strategy. Once the student has achieved certain knowledge as a result of its practices, his experience may be valuable for other parties, working, groups, experts, and so forth. In this case a student may be able to resell his knowledge by advising, teaching or giving support to others in the area. Such a *Student Acquired Knowledge* Reseller will be a low cost alternative to experts or other resources of knowledge and can therefore apart from other Content Providers be described as cost leadership strategy type participant. After the students have performed their work, the experience results can be aggregated into meaningful knowledge. The university will then be able to reuse this newly acquired knowledge to offer services to other parties in quality of an expert. Such an *University Acquired Knowledge Reseller* is also considered to follow a product differentiation strategy.

[23] According to section 3.2.

Participant	Competitive Strategy[23]	Motivation
Device Provider	Cost Leadership or Differentiation depending on the technology	The laptops used will not set any drastically special requirements since the power of computing will lie on the Grid behind it. Laptop Providers will follow a cost leadership strategy. In contrast to laptops, PDAs will probably need to provide special characteristics such as 3D acceleration for the simulations, WiFi, Bluetooth, and so forth. Therefore, a mass customization strategy is envisaged.
Grid Equipment Provider	Cost Leadership	The e-learning scenario probably builds its differentiated services reusing already existing Grid equipment. Thus, special low costs are expected from *Grid Equipment Providers*.
Grid Resource Provider	Differentiation	By providing specially tailored resources to a Grid Operator which ensure high availability and performance in general a *Grid Resource Provider* focuses on a product mass differentiation strategy. In order to achieve a comfortable collaborative final product, a high performance index engine is needed, so that services, data, people, etc. can be found in a minimum time with good query results. For this reason a *Data Indexation Provider* as a special Grid Resource Provider is driven by a mass differentiation product strategy. In order to perform knowledge mining and to enable search engines that are able to adequately work high amounts of information, high-quality *Information Retrieval Providers* become necessary in order to store information in suitable ways. A product differentiation strategy is envisaged for these special Grid Resource Providers. Location services with the ability of giving the position of users in a rough way is more than enough for the specific field trip scenario. As the technology to make this possible is well know and has been around for quite a while, it makes sense that *Location Providers* contrarily to other Grid Resource Providers specialize in a cost leadership strategy. One of the most innovative aspects that the field trip platform delivers is the capability to obtain support, contrast results, and transmit knowledge in an almost transparent way independently of the user's location by means of a meeting service. This service tackles much more than a simple e-mail, VoIP, video-communication approach. It implies networks at different layers so that e. g. a certain Expertise Provider can be contacted independently of the location taking into account the Expertise Provider's device capabilities and a connection can be built even if the expert has limited connectivity with his Network Service Provider, by offering him for instance a collect-call connection with any other provider or using low-bandwidth consuming applications. For the innovation of this *Meeting Service Provider* a product differentiation is envisaged.

Participant	Competitive Strategy[23]	Motivation
		Since most of the simulations need to be performed right on the spot while the students are on the field it is interesting that the simulation is performed with maximum celerity so that the students can make use of the results while they are still in the area. Other characteristics would include a good, easy to use, understandable, interactive visualization of the results. *Simulation Service Provider's* products are oriented towards differentiation strategies.
Grid Solution Provider	Cost Leadership or Differentiation depending on the degree of scenario-specific service innovation	In general the *Grid Solution Provider* has the ability to create an innovative product that will be personalized later on to create specific platforms such as the field trip grid e-learning platform. The Grid Solution Provider puts together network, Grid, and other services to create a highly innovative e-learning solution. Due to the nature of the product and that the product is maybe quite generic, the Grid Solution Provider in general probably follows a mass customization strategy by providing different solutions to each target group, e. g. e-learning, e-government, etc. Most of the *Groupware Providers'* typical applications such as video-conferencing, file sharing, analysis of requests, instant messaging, or photo sharing are already on the market. Although the field trip e-learning platform will imply some degree of customization for these applications, this is not strong enough to decide for a differentiation product strategy the most suitable strategy to follow. Therefore a cost leadership strategy seems more adequate for the success of Groupware Providers. In order to support single sign-on (SSO) at different Portal Providers and Network Service Providers, letting the user roam across networks with total transparency and without involving extra work concerning the user, an identity platform is needed to provide such an interoperability (e. g. account linking, SSO, etc.) between services and administrative locations, not only form the technological point of view but also from the point of view of the probably needed agreements between different service providers. As another essential and fundamentally innovative part of the field trip infrastructure a product differentiation strategy is envisaged for *Identity Providers*. In addition to being able to transparently access other resources from different portals or Network Service Providers in a "static" fashion, the possibility of also roaming across networks, simultaneously using different devices and forwarding sessions from one device to another during an on-going session is provided by a *Session Mobility Service Provider*. As this is a new aspect in the Grid world it seems clear that we are in front of a differentiated product.

Participant	Competitive Strategy[23]	Motivation
Network Equipment Provider	Cost Leadership	The e-learning scenario also reuses existing network equipment on which its services are built. Therefore a cost leadership strategy for *Network Equipment Providers* is envisaged.
Network Operator	Cost Leadership	Simple and well know access technologies are envisaged for the e-learning scenario (e. g. WLAN, Ethernet, etc.). On the core of the network high bandwidth is taken as granted, taking into account the growth rate of bandwidth during the last years. For this reason a cost leadership strategy can be forecasted for *Network Operators*.
Network Service Provider	In the great and whole focus on Cost Leadership	The *Network Service Provider* follows a cost leadership strategy as a general rule. However, in some cases it may target on a differentiated value chain leadership by providing connectivity on remote places where the University LAN provider is not able to provide any service. Since the University launches the whole field trip e-learning platform as a new and innovative product, it is the most interested party in this scenario. Therefore it seems clear that the *University LAN Provider* as a special Network Service Provider will promote specially differentiated network services in contrast to other external Network Service Providers which would target on cost leadership.
Payment Clearing Provider and Payment Provider	Cost Leadership	In the same way as for Access Providers, *Payment (Clearing) Providers* focus on a highly scalable and reliable infrastructure, whereas the offered product itself is completely standardized, what leads to a cost leadership strategy.
Plug-in Equipment Provider	Differentiation	As mainly PDAs have to be provided with special plug-in features such as 3D acceleration for the simulations, WiFi, Bluetooth, and so forth, the strategy of *Plug-in Equipment Providers* is comparable to those of PDA Providers, meaning a mass customization strategy is envisaged.
Solution Provider	Differentiation	The *Field Trip Grid Solution Provider* is in charge of taking more or less generic products from Grid Solution Providers and convert them into a purpose-specific service, i. e. a field trip Grid service with highly innovative value. For that reason it follows a product differentiation strategy.

Table 13 Competitive strategies for the generic participants in the emergency scenario

5.5. Conclusion

The e-learning scenario customer process is supported by information, material logistic and cash flow processes. Like in the e-health scenario each of these processes has high interdependencies, so they have to be supported by scenario-specific services with different degrees of domain-specificity, complexity as well as exchangeability. These services were concretely identified and

described in detail in the area of information logistic processes that are most interesting for Mobile Grid service value chains. The analysis of the services from a logistics perspective outlined that most of the services are built of numerous generic logistic services. This can be understood as an indicator that also in the e-learning scenario most of the services are quite complex. Furthermore it can be stated that the more complex the services are the more they are domain-specific. Finally the more complex services are the more participants in the Mobile Grid value chain have to invest on them (specificity).

Such considerations lead to the overall judgement of the business strategy for each of the participants performing the above mentioned services in the e-learning scenario. In order to be comparable to other scenarios and to derive general conclusions the strategies of the scenario-specific participants are aggregated towards the generic Mobile Grid value chain participants. In Table 14 the generic roles are further aggregated. It seems to be obvious that in the e-learning scenario network technology providers as well as payment providers should follow cost leadership strategies while access, content, and solution providers that are rather customer-oriented in this scenario should perform differentiated services. Grid technology providers and providers of extended mobile device infrastructures should follow context-dependent strategies. Thus, from a very high-level perspective there are only differences between the emergency and the e-learning scenario in the perception of access provision. Depending on its customer orientation access providers should rather follow differentiation strategies or trying to benefit from economies of scale.

		E-Learning Scenario
Network Technology Provision	Network Equipment Provider	CLS
	Network Operator	CLS
	Network Service Provider	CLS
Grid Technology Provision	Grid Equipment Provider	CLS
	Grid Solution Provider	COS
	Grid Resource Provider	DFS
Content Provision	Content Provider	DFS
Solution Provision	Solution Provider	DFS
Access Provision	Access Provider	DFS
Extended Mobile Device Infrastructure Provision	Plug-in Equipment Provider	DFS
	Device Provider	COS
Payment Provision	Payment Clearing Provider	CLS
	Payment Provider	CLS

Table 14 Strategic proposals for generic roles in the e-learning scenario[24]

[24] Caption of abbreviations and coloured fields: **CLS/blue** … Cost Leadership Strategy; **CDS/green** … Context-Dependent Strategy; **DFS/yellow** … Differentiation Strategy.

6. Business Models for Akogrimo Participants

6.1. Strategic Implications

Regarding again the sections 3.4, 4.5, and 5.5 in this section general strategic implications for the generic Mobile Grid value chain participants are provided and summarized in Table 15. Based on their strategic orientation in the scenarios there are certain participants that clearly should follow cost leadership strategies as their services offered are quite domain-independent, able to be standardized, or not dominated by individual customer interests. Such participants can mainly be identified in the area of network technology, payment or logistics providers, i. e. providers of infrastructure services.

		E-Health Scenario	E-Learning Scenario	Generic Proposal
Network Technology Provision	Network Equipment Provider	CLS	CLS	CLS
	Network Operator	CLS	CLS	CLS
	Network Service Provider	CLS	CLS	CLS
Grid Technology Provision	Grid Equipment Provider	CLS	CLS	CLS
	Grid Software Provider	-	-	CDS
	Grid Solution Provider	CLS	CDS	CDS
	Grid Resource Provider	CLS	DFS	CDS
	Grid Operator	DFS	-	DFS
Content Provision	Content Provider	DFS	DFS	DFS
Solution Provision	Solution Provider	DFS	DFS	DFS
Access Provision	Access Provider	CLS	DFS	CDS
Extended Mobile Device Infrastructure Provision	Plug-in Equipment Provider	DFS	DFS	DFS
	Device Provider	DFS	CDS	CDS
	Local Resource Provider	CLS	-	CDS
Payment Provision	Payment Clearing Provider	CLS	CLS	CLS
	Payment Provider	CLS	CLS	CLS
Logistics Provision	Logistics Service Provider	CLS	-	CLS

Table 15 Strategic proposals for generic roles[25]

Contrarily, participants offering highly end customer-, less standard-, and quite domain-oriented services should clearly follow differentiation strategies and benefit from economies of scope. Last not least there are participants that should follow context-dependent strategies. This is mainly true for access providers depending on the goals and customer-orientation of their offered

[25] Caption of abbreviations and coloured fields: **CLS/blue** … Cost Leadership Strategy; **CDS/green** … Context-Dependent Strategy; **DFS/yellow** … Differentiation Strategy. For Grid Software Providers in both scenarios as well as for Grid Operators, Local Resource Providers, and Logistics Service Providers in the e-health scenario the assessment of their business strategies seems not to be considered as very interesting in the particular scenario context. For this reason there are some fields without specific estimations. In some cases they are oriented according to the particular provider strategy in the e-health scenario or a little relativised. As Grid software can be differentiated as well as standardized depending on its individual use cases its provider is estimated to follow a context-dependent strategy.

services. In the area of grid technology as well as extended mobile device infrastructure different types of providers have to be differentiated: grid equipment providers should follow a cost leadership strategy while Grid operators should closely be oriented towards solution providers and therefore follow a differentiation strategy. Providers in between are asked to follow context-dependent strategies. The same is true for Extended Mobile Device Infrastructure Providers, especially for device and local resource providers that, deviating from their role in the e-health scenario, in general should try and follow context-dependent challenges. Plug-in equipment providers are expected to follow differentiation strategies as their differentiated products assure their success.

6.2. Competitive Edge for the Industry Participants

In this deliverable the coherences of business modelling in Mobile Grid value chains were analyzed and integrated in a business modelling framework. On this basis it is possible to point out essential competitive edges for each of the industry participants. As they will provide their exploitation goals in D6.3.2 ("Initial Exploitation Plan") that is submitted later in the project, detailed considerations on the competitive edges for each of the industry participants have to be postponed and in this section only the strategic implications for each of the generic Mobile Grid value chain participants outlined in section 6.1 are applied to the different types of Akogrimo partners. This examination is based on the *very initial* exploitation plans of the Akogrimo partners (cf. ID6.3.1 ("Market Study")).

The numbers in Table 16 show in how many of the very initial exploitation plans a certain type of partners could accept a certain generic role. For example, the academic partners would participate as concept or teaching providers in 16 out of 20 (0.8) exploitation items. The numbers were generated in the following way:[26] For each of the exploitation items the partner's potential roles according to the generic Mobile Grid services value chain participants were assigned either according to their today's capabilities or according to their vague future interests. It has to be remarked that a role called "Concept/Teaching Provider" was introduced that does not directly participate in the daily Mobile Grid services value chain. It mainly concerns academic partners.

[26] It is a clear intent of the deliverable to work with numbers that are made anonymous. Thus, the current fuzziness of the numbers is expressed and the Akogrimo partners are not influenced by theoretical forecasts when they try and find their appropriate strategy. On the contrary, it is possible for this deliverable to be evaluated after the strategy definition of each partner.

Types of Partners	Concept/Teaching Provider	Network Equipment Provider	Network Operator	Network Service Provider	Grid Equipment Provider	Grid Resource Provider	Grid Software Provider	Grid Solution Provider	Grid Operator	Content Provider	Solution Provider	Access Provider	Plug-In Equipment Provider	Device Provider	Local Resource Provider	Payment Clearing Provider	Payment Provider
Telecommunication Partners	0.2		**0.5**	**0.2**	**0.1**	**0.2**		**0.2**	**0.2**	0.1	0.3		0.1	0.1		0.2	0.2
Grid Technology Industry Partners	0.6					**0.2**	**0.4**	**0.2**			0.2						
Conceptual Partners	**0.7**					0.3	0.3			0.3							
Academic Partners	**0.8**		0.2	0.1		0.2	0.1	0.2	0.2	0.1	0.1						

Cost leadership strategy proposed

Context-dependent strategy proposed

Differentiation strategy proposed

x Area of exploitation interests as a certain value chain participant mainly based on ID6.3.1 ("Market Study")

(x) Area of possible future exploitation interests as a certain value chain participant mainly based on ID6.3.1 ("Market Study")

Table 16 Assignment of types of Akogrimo partners to generic Mobile Grid value chain participants according to their very initial exploitation goals (to be refined during the project)

In Table 16 the above mentioned examination is evaluated. The numbers of assignments of all partners of one type to the different generic roles were counted and divided by the approximate diversity of exploitation efforts per partner type. Regarding the bold numbers in Table 16 each partner type's dominating strategy can be identified with respect to its focus (concept/teaching, network, Grid, content, solution, access, extended mobile device infrastructure, or payment). This shows that conceptual as well as academic partners mainly follow consulting or teaching goals while none of the industry partners focuses on a clear differentiation strategy. Thus, there is still much potential for development for the one or the other company towards a differentiation strategy or for new market players to take the role of clearly customer-oriented service integrators. Last not least Table 16 indicates that for exploitation issues there could still be some opportunities for providers with empty or at least low-valued columns.

Nevertheless, the numbers indicate that telecommunication companies offer a rich choice of services. Starting from rather standardized network technology services, they have also interests in the area of Grid technology and in rather end customer oriented areas such as content, solution, or plug-in equipment provision as well as in the payment business. Grid technology providers seem to clearly focus on their core competencies. Whether they will choose a rather cost leadership or differentiation strategy could depend on the sophistication of their services. Finally, conceptual as well as academic partners mainly work apart from the day to day business as providers of accordant background contributions.

6.3. Conclusions

This deliverable offers three main results. On the one hand a business modelling framework is offered and on the other hand a method for very initial indications on the concrete development of types of companies mainly based on their very early exploitation goals is provided. Furthermore a procedure for the application of the Akogrimo business modelling framework is suggested.

The business modelling framework that has to be integratively seen in the context of the Akogrimo value network provided by D3.2.1 ("The Akogrimo Conolidated Value Chain") is

based on a logistics perspective for reasons of generalization and value chain process logic orientation, as well as the particular requirements of Akogrimo's business modelling efforts. It comprises different techniques:

- Information logistic, material logistic, and cash flows *processes* are derived from customer processes in order to clearly focus on *customer-oriented* business models.
- Each of the logistic processes is regarded as being supported by several business-oriented services that are differently *complex*, *domain-oriented*, and *exchangeable*. Doing so, business models are clearly *service-oriented* and flexible.
- Participants in the Mobile Grid value chain are located in rather organization-oriented *multi-tiered supply chains* and allocated to the above mentioned services as their providers or receivers.
- Regarding the service composition from the logistic perspective their complexity, domain-specificity, and thus exchangeability can be evaluated. From there conclusions on the *strategic orientation* (rather cost leadership or differentiation strategy) can be derived.

Furthermore it can be stated that the most common attributes of business models are included in the business modelling framework presented in this deliverable as Table 17 outlines.

Attribute	Frequency
Actors/Roles	64%
Enterprise Considerations	54%
Finance/Business Volume (Flows)	54%
Goods/Services (Flows)	50%
Added Value	43%
Abstraction/Aggregation	32%
Competitive Environment	32%
Strategy/Vision/Goal	29%
Benefit	25%
Value Chain/Core Competencies	25%
Earnings	21%
Information (Flows)	21%
Processes/Procedure	21%
Actor relationships	18%
Technology	18%
Enterprise Unit Considerations	14%
External Communication Concept	11%
Form of Organisation	11%
Growth	11%
Legal Aspects	11%
Resources (General)	11%
Enterprise Network Considerations	7%
Critical Success Factors	7%
Product Life Cycle	7%
Control Mechanisms	4%

Table 17: Relative frequency of business model attributes according to [23] and their inclusion in the Akogrimo Business Modelling Framework

Apart from "Earnings" which firstly have to be regarded in detail in the context of Akogrimo's exploitation efforts (cf. D6.3.2 ("Initial Exploitation Plan")) all attributes with a frequency in

common definitions of more than 15% were included. Furthermore "Resources" were discussed as they play a manifold role in the context of Mobile Grids.

Considering the concrete types of Akogrimo partners it can be forecasted from a rather theoretical point of view that telecommunication companies will probably assume a large variety of generic roles in the Mobile Grid value chain. Grid technology providers in contrast seem to rather clearly focus on their core competencies and for this reason mainly accept their traditional roles in the value chain. Whether they will choose a rather cost leadership or differentiation strategy could depend on the sophistication of their services. Finally, conceptual as well as academic partners mainly work apart from the day to day business as conceptual or teaching providers.

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Annex A. Detailed Service Descriptions

A.1. Emergency Scenario

This section describes services for the emergency scenario (cf. section 4.1.1 and 4.3) as they have been identified in D2.3.2 ("Validation Scenarios").

Deployment Service

Description Area	Description Criteria	Description
Service Basics	Service Name	Deployment Service
	Short Service Description	Provide download functionalities to download remote services on mobile devices
	Service Goal(s)	Remotes services are downloaded and ready to be used on mobile device
	Service Characteristics	Execution
Service Details	Service Provider	Access Provider
		Configurator: Access Provider
	Service Receiver	User
		Customer: Patient
	Required Resources	Communications infrastructure, mobile device
	Minimum Service Level	Service is transmitted to mobile device
	Quality Service Level	Service is fully accessible for the patient
Service Subordination	Service Interfaces	n/a
	Further Service Dependencies	User Management/Profile Management Service
	Critical Success Factors	Time from service request to availability of service
Value Chain Details	Supply Chain Coverage	Customer, Configurator, Vendor, Producer, Supplier
	Cost Model	Volume-based tariff
	Value Chain Earnings	Customer

Table 18 Deployment service description

Voice over IP (VoIP) Service

Description Area	Description Criteria	Description
Service Basics	Service Name	Voice over IP (VoIP) Service
	Short Service Description	Enable voice over IP communication for all members in a virtual emergency environment.
	Service Goal(s)	VoIP connections are established, forwarded, and merged. Subscribers are added or removed.
	Service Characteristics	Execution
Service Details	Service Provider	Grid Solution Provider
		Supplier: Communications Provider
	Service Receiver	User, Logistics Service Provider
		Customer: Patient; Logistics Service Provider: Emergency Car Provider, Heart Attack Specialist, Hospital
	Required Resources	Communications infrastructure, mobile communication devices
	Minimum Service Level	Basic VoIP connection is established
	Quality Service Level	Value-added enhanced VoIP services are available, including advanced services such as conference calls.
Service Subordination	Service Interfaces	n/a
	Further Service Dependencies	User Management/Profile Management Service
	Critical Success Factors	High speech quality, robust connections
Value Chain Details	Supply Chain Coverage	Customer, Configurator, Vendor, Producer, Supplier, Logistics Service Provider
	Cost Model	Time-based tariff or flat rate
	Value Chain Earnings	Customer, Logistics Service Provider

Table 19 Voice over IP (VoIP) service description

Translation Service

Description Area	Description Criteria	Description
Service Basics	Service Name	Translation Service
	Short Service Description	Translate existing patient's data from one language to another
	Service Goal(s)	Patient's data is successfully recognized as being of source language and translated to destination language.
	Service Characteristics	Execution
Service Details	Service Provider	Grid Solution Provider
		Supplier: Translation Service Provider
	Service Receiver	Logistics Service Provider
		Logistics Service Provider: Heart Attack Specialist, Hospital
	Required Resources	Communications infrastructure, mobile device, translation engine
	Minimum Service Level	Patient's data is fully automatically translated.
	Quality Service Level	Automatically performed translation is validated by interpreter.
Service Subordination	Service Interfaces	n/a
	Further Service Dependencies	User Management/Profile Management Service
	Critical Success Factors	Specific (i.e. accurate) and context-related translation
Value Chain Details	Supply Chain Coverage	Configurator, Vendor, Producer, Supplier, Logistics Service Provider
	Cost Model	Volume-based tariff or transaction-fee
	Value Chain Earnings	Logistics Service Provider

Table 20 Translation service description

Medical Data Logger Service

Description Area	Description Criteria	Description
Service Basics	Service Name	Medical Data Logger Service Description
	Short Service Description	Store and retrieve monitored patient's data
	Service Goal(s)	Requested medical data (monitored by a medical device) is stored completely and accessible for authorized personnel as well as for the patient.
	Service Characteristics	Execution
Service Details	Service Provider	Grid Resource Provider, Local Resource Provider
		Supplier: Patient Record Storage Provider; Patient as ECG Data Provider
	Service Receiver	User, Logistics Service Provider
		Customer: Patient, Logistics Service Provider: Heart Attack Specialist, Hospital
	Required Resources	Communications infrastructure, mobile communication devices, monitoring devices, storage and information retrieval infrastructure
	Minimum Service Level	All received data is stored and can be retrieved completely.
	Quality Service Level	Fine-grained information retrieval on stored data is possible
Service Subordination	Service Interfaces	n/a
	Further Service Dependencies	Medical device service, User Management/ Profile Management Service
	Critical Success Factors	Reliable transactions, availability, scalability, and up-time of service
Value Chain Details	Supply Chain Coverage	Customer, Configurator, Vendor, Producer, Supplier, Logistics Service Provider
	Cost Model	Transaction-fee
	Value Chain Earnings	Customer, Logistics Service Provider

Table 21 Medical data logger service description

User Management/Profile Management Service

Description Area	Description Criteria	Description
Service Basics	Service Name	User Management/Profile Management Service
	Short Service Description	Manage users together with their service profile Management / Profile Management Service of serviceable structure personnel as well as for the patient.
	Service Goal(s)	Users can register and take roles. Management includes authentication, authorization levels, accounting, contract, and service level activities.
	Service Characteristics	Planning
Service Details	Service Provider	Solution Provider
		Producer: Health Service Provider
	Service Receiver	User
		Customer: Patient
	Required Resources	Communications infrastructure, A4C (Authentication, Authorization, Accounting, Auditing, and Charging) infrastructure
	Minimum Service Level	Users can register and manage accounting information.
	Quality Service Level	Users can take configurable roles, service level agreements are supported
Service Subordination	Service Interfaces	n/a
	Further Service Dependencies	-
	Critical Success Factors	Easily understandable tool for managing services and user account, whereas services reflect customer's individual needs
Value Chain Details	Supply Chain Coverage	Customer, Configurator, Vendor
	Cost Model	Subscription to basic service bundle, additional services or service bundles available at a time-, volume- or flat rate-basis, depending on type of service
	Value Chain Earnings	Customer

Table 22 User management/profile management service description

E-Health User Portal Service

Description Area	Description Criteria	Description
Service Basics	Service Name	E-Health User Portal Service
	Short Service Description	Make user-specific services of the Heart Monitoring and Emergency Service available
	Service Goal(s)	All services are available according to a user profile and an assigned user role
	Service Characteristics	Execution
Service Details	Service Provider	Solution Provider
		Vendor: Health Service Provider
	Service Receiver	User
		Customer: Patient
	Required Resources	Communications infrastructure, mobile devices
	Minimum Service Level	User is authenticated and ready to use services according to an assigned role
	Quality Service Level	Quality-of-Service is provided, such as guarantees with respect to response time. Current user-context information is taken into account and workflows are adapted to changes in context.
Service Subordination	Service Interfaces	n/a
	Further Service Dependencies	User Management/Profile Management Service, Heart Monitoring and Emergency Service (HMES), User Resource Context Service
	Critical Success Factors	Timeliness and accuracy of available services
Value Chain Details	Supply Chain Coverage	Customer, Configurator, Vendor, Producer, Supplier, Logistics Service Provider
	Cost Model	Depending on cost model of offered sub-services (cf. User Management / Profile Management Service)
	Value Chain Earnings	Customer, Logistics Service Provider

Table 23 E-health user portal service description

Medical Personnel and Resource Locator Service

Description Area	Description Criteria	Description
Service Basics	Service Name	Medical Personnel and Resource Locator Service
	Short Service Description	Locate real-world persons, such as first responders and specialists, in order to build a virtual emergency environment
	Service Goal(s)	Depending on a patient's situation, necessary personnel and resources are identified and located.
	Service Characteristics	Execution
Service Details	Service Provider	Content Provider
		Supplier: Hospital Locator, Emergency Car Locator
	Service Receiver	Logistics Service Provider
		Logistics Service Provider: Emergency Car Provider, Heart Attack Specialist, Hospital
	Required Resources	Communications infrastructure, resource and personnel management information system
	Minimum Service Level	Resources and personnel is located
	Quality Service Level	Additional criteria for selecting/locating resources and personnel are available, such as locating a specialist for allergies
Service Subordination	Service Interfaces	n/a
	Further Service Dependencies	User Management/Profile Management Service, Heart Monitoring and Emergency Service (HMES), User Resource Context Service
	Critical Success Factors	Optimal allocation of resources and personnel according to a patient's situation
Value Chain Details	Supply Chain Coverage	Customer, Configurator, Vendor, Producer, Supplier, Logistics Service Provider
	Cost Model	Transaction-fee
	Value Chain Earnings	Logistics Service Provider

Table 24 Medical personnel and resource locator service description

User/Resource Location Service

Description Area	Description Criteria	Description
Service Basics	Service Name	User/Resource Location Service
	Short Service Description	Locate a user's geographic position
	Service Goal(s)	User is located
	Service Characteristics	Execution
Service Details	Service Provider	Grid Solution Provider
		Supplier: Location Provider
	Service Receiver	Solution Provider
		Vendor: Health Service Provider
	Required Resources	Communications infrastructure, mobile devices, geographical positioning system
	Minimum Service Level	Position is determined
	Quality Service Level	Geographical range of user location is within several meters. Location works also in buildings
Service Subordination	Service Interfaces	n/a
	Further Service Dependencies	User Management/Profile Management Service, Heart Monitoring and Emergency Service (HMES)
	Critical Success Factors	Accuracy and speed of localization process
Value Chain Details	Supply Chain Coverage	Customer, Configurator, Vendor, Producer, Supplier, Logistics Service Provider
	Cost Model	Transaction-fee
	Value Chain Earnings	Customer, Logistics Service Provider

Table 25 User/resource location service description

Dynamic Navigation Service

Description Area	Description Criteria	Description
Service Basics	Service Name	Dynamic Navigation Service
	Short Service Description	Manage coordinates of grid resources and calculate optimal routes between them
	Service Goal(s)	An optimal route is calculated between grid resources
	Service Characteristics	Execution
Service Details	Service Provider	Grid Solution Provider
		Supplier: Location Provider
	Service Receiver	Solution Provider
		Vendor: Health Service Provider
	Required Resources	Communications infrastructure, mobile devices, geographical positioning system, routing system
	Minimum Service Level	A route is calculated
	Quality Service Level	Depending on chosen criteria, an optimal route is available
Service Subordination	Service Interfaces	n/a
	Further Service Dependencies	User Management/Profile Management Service, Traffic Control Service, Medical Personnel and Resource Locator Service, User/Resource Location Service
	Critical Success Factors	Provision for optimization criteria. Adaptive routes (reacting e.g. on traffic jams)
Value Chain Details	Supply Chain Coverage	Configurator, Vendor, Producer, Supplier, Logistics Service Provider
	Cost Model	Transaction-fee
	Value Chain Earnings	Logistics Service Provider

Table 26 Dynamic navigation service description

Traffic Surveillance Service

Description Area	Description Criteria	Description
Service Basics	Service Name	Traffic Surveillance Service
	Short Service Description	Observe traffic status and trace traffic jams
	Service Goal(s)	Current traffic situation is reflected and serves for optimizing routes
	Service Characteristics	Execution
Service Details	Service Provider	Content Provider
		Supplier: Emergency Car Locator
	Service Receiver	Solution Provider
		Vendor: Health Service Provider
	Required Resources	Communications infrastructure, cameras
	Minimum Service Level	Traffic situation is observed and transmitted
	Quality Service Level	Forecasts and recommendations (alternative passages) are available
Service Subordination	Service Interfaces	n/a
	Further Service Dependencies	Traffic Control Service
	Critical Success Factors	Timeliness of traffic information
Value Chain Details	Supply Chain Coverage	Configurator, Vendor, Producer, Supplier, Logistics Service Provider
	Cost Model	Flat rate
	Value Chain Earnings	Logistics Service Provider

Table 27 Traffic surveillance service description

User/Resource Context Service

Description Area	Description Criteria	Description
Service Basics	Service Name	User/Resource Context Service
	Short Service Description	Determine and deliver a user's or grid resource's current context
	Service Goal(s)	User- and grid resources-specific context information in available
	Service Characteristics	Execution
Service Details	Service Provider	Grid Resource Provider, Content Provider
		Supplier: Emergency Car Locator, Hospital Locator, Patient Record Storage Provider, Evidence- & Experience-based Medicine Information Provider
	Service Receiver	Solution Provider, Logistics Service Provider
		Vendor: Health Service Provider, Logistics Service Provider: Emergency Car Provider, Heart Attack Specialist, Hospital
	Required Resources	Communications infrastructure, sensors/metering infrastructure
	Minimum Service Level	Basic status of a user or grid resource is available
	Quality Service Level	Context information contain semantics, such as patient's diagnosis information
Service Subordination	Service Interfaces	n/a
	Further Service Dependencies	E-Health User Portal Service
	Critical Success Factors	Granularity of context information
Value Chain Details	Supply Chain Coverage	Patient, Configurator, Vendor, Producer, Supplier, Logistics Service Provider
	Cost Model	Volume-based tariff
	Value Chain Earnings	Solution Provider

Table 28 User/resource context service description

Traffic Control Service

Description Area	Description Criteria	Description
Service Basics	Service Name	Traffic Control Service
	Short Service Description	Incorporate route planning and traffic surveillance information for route optimization as well as potential traffic coordination.
	Service Goal(s)	Alter route optimization tasks
	Service Characteristics	Execution
Service Details	Service Provider	Content Provider
		Supplier: Emergency Car Locator
	Service Receiver	Logistics Service Provider
		Logistics Service Provider: Emergency Car Provider, Heart Attack Specialist, Hospital
	Required Resources	Communications infrastructure, mobile devices, geographical positioning system, routing system
	Minimum Service Level	Routes can be adapted
	Quality Service Level	Real-time optimization of route
Service Subordination	Service Interfaces	
	Further Service Dependencies	User Management/Profile Management Service, Dynamic Navigation Service, Traffic Surveillance Service
	Critical Success Factors	Speed
Value Chain Details	Supply Chain Coverage	Patient, Configurator, Vendor, Producer, Supplier, Logistics Service Provider
	Cost Model	Time-based tariff
	Value Chain Earnings	Logistics Service Provider

Table 29 Traffic control service description

Virtual Emergency Health Record (VEHR) Service

Description Area	Description Criteria	Description
Service Basics	Service Name	Virtual Emergency Health Record (VEHR) Service
	Short Service Description	Collect available patient's records and determine emergency-relevant information
	Service Goal(s)	Provide on-demand situation-specific patient's records
	Service Characteristics	Execution
Service Details	Service Provider	Grid Resource Provider
		Supplier: Patient Record Storage Provider
	Service Receiver	Logistics Service Provider
		Logistics Service Provider: Heart Attack Specialist, Hospital
	Required Resources	Communications infrastructure, mobile devices
	Minimum Service Level	Available patient's records are provided
	Quality Service Level	Patient's records are presented by level of relevance
Service Subordination	Service Interfaces	
	Further Service Dependencies	User Management/Profile Management Service, Virtual Emergency Environment (VEE)
	Critical Success Factors	Determination of relevance
Value Chain Details	Supply Chain Coverage	Configurator, Vendor, Producer, Supplier, Logistics Service Provider
	Cost Model	Transaction-fee
	Value Chain Earnings	Logistics Service Provider

Table 30 Virtual emergency health record (VEHR) service description

Virtual Emergency Environment (VEE) Service

Description Area	Description Criteria	Description
Service Basics	Service Name	Virtual Emergency Environment (VEE) Service
	Short Service Description	Centrally store and provide diagnosis and status information to involved participants, such doctors on site
	Service Goal(s)	Offer a communication and managing center with respect to an emergency site
	Service Characteristics	Execution
Service Details	Service Provider	Solution Provider
		Vendor: Health Service Provider
	Service Receiver	User, Logistics Service Provider
		Customer: Patient, Logistics Service Provider: Heart Attack Specialist, Hospital
	Required Resources	Communications infrastructure, mobile devices
	Minimum Service Level	All involved participants are provided by information relevant for taking care of the patient
	Quality Service Level	Real-time processing of incoming status changes
Service Subordination	Service Interfaces	
	Further Service Dependencies	User Management/Profile Management Service, Virtual Emergency Health Record (VEHR) Service, Health Simulation and Diagnosis Support Service
	Critical Success Factors	Speed, scalability
Value Chain Details	Supply Chain Coverage	Customer, Configurator, Vendor, Producer, Supplier, Logistics Service Provider
	Cost Model	Depending on cost model of offered sub-services (cf. User Management / Profile Management Service)
	Value Chain Earnings	Customer, Logistics Service Provider

Table 31 Virtual emergency environment service description

Remote Medical Device Service

Description Area	Description Criteria	Description
Service Basics	Service Name	Remote Medical Device Service
	Short Service Description	Request data from a mobile grid resource/mobile device
	Service Goal(s)	Requested data is received and provided as a grid service
	Service Characteristics	Execution
Service Details	Service Provider	Grid Resource Provider, Content Provider, Grid Solution Provider, Logistics Service Provider
		Logistics Service Provider: Emergency Car Provider, Heart Attack Specialist, Hospital, Supplier: All
	Service Receiver	Patient, Logistics Service Provider, Solution Provider, Grid Operator
		Customer: Patient, Logistics Service Provider: Emergency Car Provider, Heart Attack Specialist, Hospital, Vendor: Health Service Provider, Producer: Grid Operator
	Required Resources	Communications infrastructure, grid resource, mobile devices
	Minimum Service Level	Requested data is received
	Quality Service Level	Quality-of-Service guarantees are available
Service Subordination	Service Interfaces	
	Further Service Dependencies	User Management/Profile Management Service, Medical Analysis Service
	Critical Success Factors	Response time
Value Chain Details	Supply Chain Coverage	Customer, Configurator, Vendor, Producer, Supplier, Logistics Service Provider
	Cost Model	Volume-based tariff
	Value Chain Earnings	Customer, Logistics Service Provider

Table 32 Remote medical device service description

Medical Analysis Service

Description Area	Description Criteria	Description
Service Basics	Service Name	Medical Analysis Service
	Short Service Description	Analyse monitored patient data permanently and recognize emergency situations
	Service Goal(s)	Emergency situations are triggered if needed
	Service Characteristics	Execution
Service Details	Service Provider	Solution Provider
		Vendor: Health Service Provider
	Service Receiver	User
		Customer: Patient
	Required Resources	Communications infrastructure, monitoring and analysis infrastructure, mobile devices
	Minimum Service Level	Emergency situations are recognized
	Quality Service Level	False alarm is reduced
Service Subordination	Service Interfaces	
	Further Service Dependencies	User Management/Profile Management Service, Health Simulation and Diagnosis Support Service
	Critical Success Factors	Accuracy in emergency detection
Value Chain Details	Supply Chain Coverage	Customer, Configurator, Vendor, Producer, Supplier
	Cost Model	Flat rate
	Value Chain Earnings	Customer

Table 33 Medical analysis service description

Health Simulation and Diagnosis Support Service

Description Area	Description Criteria	Description
Service Basics	Service Name	Health Simulation and Diagnosis Support Service
	Short Service Description	Provide a diagnosis by simulating a patient's status, based on currently analyzed patient's data, available patient's records, and medical evidence knowledge
	Service Goal(s)	Provide an accurate diagnosis
	Service Characteristics	Execution
Service Details	Service Provider	Solution Provider
		Vendor: Health Service Provider
	Service Receiver	User, Logistics Service Provider
		Customer: Patient, Logistics Service Provider: Emergency Car Provider, Heart Attack Specialist, Hospital
	Required Resources	Communications infrastructure, medical knowledge base, mobile devices
	Minimum Service Level	Diagnosis is provided
	Quality Service Level	Simulation for diagnosis considers the complete range of information
Service Subordination	Service Interfaces	
	Further Service Dependencies	User Management/Profile Management Service, Medical Analysis Service, Hearth Monitoring and Emergency Service (HMES)
	Critical Success Factors	Correctness of diagnosis
Value Chain Details	Supply Chain Coverage	Customer, Configurator, Vendor, Producer, Supplier, Logistics Service Provider
	Cost Model	Flat rate
	Value Chain Earnings	Customer, Logistics Service Provider

Table 34 Health simulation and diagnosis support service description

Heart Monitoring and Emergency Service

Description Area	Description Criteria	Description
Service Basics	Service Name	Heart Monitoring and Emergency Service
	Short Service Description	Orchestrates all services in a user-specific way
	Service Goal(s)	Provide an application-specific portal
	Service Characteristics	Execution
Service Details	Service Provider	Access Provider
		Configurator: Access Provider
	Service Receiver	User, Logistics Service Provider
		Customer: Patient, Logistics Service Provider: Emergency Car Provider, Heart Attack Specialist, Hospital
	Required Resources	Communications infrastructure, mobile devices
	Minimum Service Level	All supporting processes are combined in the right, situation-specific way
	Quality Service Level	Quality-of-Service guarantees are available
Service Subordination	Service Interfaces	
	Further Service Dependencies	User Management/Profile Management Service, Health Simulation and Diagnosis Support Service, Virtual Emergency Environment, E-Health User Portal Service
	Critical Success Factors	User- and device-specific presentation
Value Chain Details	Supply Chain Coverage	Customer, Configurator, Vendor, Producer, Supplier, Logistics Service Provider
	Cost Model	Volume-based or time-based tariff
	Value Chain Earnings	Customer, Logistics Service Provider

Table 35 Heart monitoring and emergency service description

A.2. E-Learning Scenario

This section describes services for the e-learning scenario (cf. section 5.1.1 and 5.3) according to the schema introduced in section 3.3.2.2.

Network Infrastructure Setup Service

Description Area	Description Criteria	Description
Service Basics	Service Name	Network Infrastructure Setup Service
	Short Service Description	Setup of the necessary network infrastructure
	Service Goal(s)	Operative communication facilities
	Service Characteristics	Execution
Service Details	Service Provider	Network Service Provider
		Supplier: University LAN Provider, Greek POTS
	Service Receiver	Solution Provider
		Supplier: E-Learning Platform Provider
	Required Resources	Equipment, cabling, ARs, Routers, …
	Minimum Service Level	Minimal connectivity
	Quality Service Level	Premium connectivity, e. g. via optical fibre, QoS, …
Service Subordination	Service Interfaces	Management of routers, monitor state of connectivity, load balancing
	Further Service Dependencies	n/a
	Critical Success Factors	Uptime of services, availability
Value Chain Details	Supply Chain Coverage	Tiers 5, 6, 7
	Cost Model	Fixed tariff
	Value Chain Earnings	University

Table 36 Network setup infrastructure service description

Grid Infrastructure Setup Service

Description Area	Description Criteria	Description
Service Basics	Service Name	Grid Infrastructure Setup Service
	Short Service Description	Setup of the necessary Grid infrastructure
	Service Goal(s)	Provide computational resources: servers, Grid software, etc.
	Service Characteristics	Execution
Service Details	Service Provider	Grid Operator
		Supplier: Grid Operator
	Service Receiver	Solution Provider
		Supplier: E-Learning Platform Provider
	Required Resources	Equipment, servers, Grid software
	Minimum Service Level	Provide Grid resources
	Quality Service Level	Access to configurable computational resources, dedicated servers, preferment usage
Service Subordination	Service Interfaces	Management of computing resources, machine uptime, monitoring, load balancing
	Further Service Dependencies	n/a
	Critical Success Factors	Uptime of services, availability
Value Chain Details	Supply Chain Coverage	Tiers 5, 6, 7
	Cost Model	Fixed tariff plus charging per cycle
	Value Chain Earnings	University

Table 37 Grid infrastructure setup service description

Solution Setup Service

Description Area	Description Criteria	Description
Service Basics	Service Name	Solution Setup Service
	Short Service Description	Setup access and payment services
	Service Goal(s)	Provide means to network and Grid to enable commercial purposes
	Service Characteristics	Execution
Service Details	Service Provider	Grid Solution Provider
		Supplier: E-Learning Platform Provider
	Service Receiver	Solution Provider
		Producer: Field Trip Grid Solution Provider
	Required Resources	Banking and cryptography
	Minimum Service Level	Authenticate user
	Quality Service Level	Authentication, authorization, accounting, charging usage
Service Subordination	Service Interfaces	Monitoring, charging schemas, roaming agreements, …
	Further Service Dependencies	n/a
	Critical Success Factors	Sensation of security
Value Chain Details	Supply Chain Coverage	Tiers 2, 3, 4, 5, 6, 7
	Cost Model	Fixed tariff and per transaction
	Value Chain Earnings	University

Table 38 Solution setup description

Mobile Devices Delivery Service

Description Area	Description Criteria	Description
Service Basics	Service Name	Mobile Devices Delivery Service
	Short Service Description	Device delivery
	Service Goal(s)	Provide user with necessary working devices
	Service Characteristics	Execution
Service Details	Service Provider	Device Provider
		Supplier: Laptop Provider, PDA Provider
	Service Receiver	Solution Provider
		Supplier: E-Learning Platform Provider
	Required Resources	Hardware production
	Minimum Service Level	Deliver hardware
	Quality Service Level	Deliver premium high-customized hardware accomplishing a deadline plus a good post-sell support
Service Subordination	Service Interfaces	Purchase request
	Further Service Dependencies	n/a
	Critical Success Factors	Reliability
Value Chain Details	Supply Chain Coverage	Tiers 1, 4, 7
	Cost Model	Fixed tariff
	Value Chain Earnings	University

Table 39 Mobile devices delivery description

Groupware Provision Service

Description Area	Description Criteria	Description
Service Basics	Service Name	Groupware Provision Service
	Short Service Description	Develop and distribute groupware
	Service Goal(s)	Provide user with necessary working devices
	Service Characteristics	Execution
Service Details	Service Provider	Grid Solution Provider
		Supplier: Groupware Provider
	Service Receiver	Solution Provider
		Supplier: E-Learning Platform Provider
	Required Resources	n/a
	Minimum Service Level	Limited groupware
	Quality Service Level	User friendly and transparent application for comfortable interchange of results, meetings, presentations, search of users, etc. …
Service Subordination	Service Interfaces	Purchase request
	Further Service Dependencies	n/a
	Critical Success Factors	Communication capabilities provided
Value Chain Details	Supply Chain Coverage	Tiers 1, 4, 5
	Cost Model	Fixed tariff
	Value Chain Earnings	University

Table 40 Groupware provision service description

User Registration Service

Description Area	Description Criteria	Description
Service Basics	Service Name	User Registration Service
	Short Service Description	Register user, set account, authenticate cryptographic material, …
	Service Goal(s)	Get a user to become part of the e-learning platform
	Service Characteristics	Execution
Service Details	Service Provider	Access Provider
		Configurator: Portal Provider
	Service Receiver	User
		Customer: Student
	Required Resources	Student data: identification, preferences, profile, descriptions, databases, …
	Minimum Service Level	Anonymous access
	Quality Service Level	User personalized environment
Service Subordination	Service Interfaces	Database access
	Further Service Dependencies	n/a
	Critical Success Factors	Flexibility, personalization
Value Chain Details	Supply Chain Coverage	Tiers 1, 2, 3, 4, 5
	Cost Model	Fixed tariff
	Value Chain Earnings	University

Table 41 User registration service description

People Location Service

Description Area	Description Criteria	Description
Service Basics	Service Name	People Location Service
	Short Service Description	Localize experts, groups, and partners
	Service Goal(s)	Transparently build a collaborative workspace
	Service Characteristics	Execution
Service Details	Service Provider	Grid Solution Provider
		Supplier: Meeting Service Provider
	Service Receiver	Solution Provider
		Supplier: E-Learning Platform Provider
	Required Resources	Location awareness, seamless mobility, groupware tools, context awareness
	Minimum Service Level	Localize person
	Quality Service Level	Localize person taking into account context and set the users ready to collaborate
Service Subordination	Service Interfaces	Different search types
	Further Service Dependencies	n/a
	Critical Success Factors	Match of person to find according needs
Value Chain Details	Supply Chain Coverage	Tiers 1, 5
	Cost Model	Fixed tariff
	Value Chain Earnings	University

Table 42 People location description

User Presence Provision Service Service

Description Area	Description Criteria	Description
Service Basics	Service Name	User Presence Provision Service
	Short Service Description	Collect information about presence and profile
	Service Goal(s)	Service personalization
	Service Characteristics	Execution
Service Details	Service Provider	Grid Solution Provider; in some cases: User
		Supplier: Location Provider; in some cases: Customer: Student
	Service Receiver	Solution Provider
		Supplier: E-Learning Platform Provider
	Required Resources	Current user information
	Minimum Service Level	User connected/disconnected information
	Quality Service Level	User mood, localization, device capabilities, …
Service Subordination	Service Interfaces	Profile
	Further Service Dependencies	n/a
	Critical Success Factors	Suitable presence description language
Value Chain Details	Supply Chain Coverage	Tiers 1, 5
	Cost Model	Fixed tariff
	Value Chain Earnings	University

Table 43 User presence provision service description

Information Indexation Service

Description Area	Description Criteria	Description
Service Basics	Service Name	Information Indexation Service
	Short Service Description	Index and organize information
	Service Goal(s)	Provide powerful searching engine
	Service Characteristics	Execution
Service Details	Service Provider	Grid Resource Provider
		Supplier: Data Indexation Provider
	Service Receiver	Grid Resource Provider
		Supplier: Information Retrieval Provider
	Required Resources	Information to process, indexation software
	Minimum Service Level	Organize information
	Quality Service Level	Organize information in such a way that queries can be done fast and accurately
Service Subordination	Service Interfaces	-
	Further Service Dependencies	n/a
	Critical Success Factors	Powerful indexation algorithms
Value Chain Details	Supply Chain Coverage	Tiers 4, 5, 6
	Cost Model	Fixed tariff
	Value Chain Earnings	University

Table 44 Information indexation description

Information Adaptation Service

Description Area	Description Criteria	Description
Service Basics	Service Name	Information Adaptation Service
	Short Service Description	Adapt information to match its most suitable format according to the current use
	Service Goal(s)	E.g. fit adapted information for indexation, speech-to-text, adapt video to device characteristics
	Service Characteristics	Execution
Service Details	Service Provider	Grid Resource Provider
		Supplier: Grid Resource Provider specialized on information adaptation
	Service Receiver	Solution Provider
		Supplier: E-Learning Platform Provider
	Required Resources	Codecs, data files, algorithms
	Minimum Service Level	Convert information from one format to another
	Quality Service Level	Intelligently convert information optimizing quality loose according to context information
Service Subordination	Service Interfaces	-
	Further Service Dependencies	n/a
	Critical Success Factors	Powerful conversion algorithms and intelligence to follow a workflow matching each situation
Value Chain Details	Supply Chain Coverage	Tiers 4, 5, 6
	Cost Model	Fixed tariff
	Value Chain Earnings	University

Table 45 Information adaptation service description

Simulation Performing Service

Description Area	Description Criteria	Description
Service Basics	Service Name	Simulation Performing Service
	Short Service Description	Perform simulation with collected data using back-end computational power
	Service Goal(s)	Provide a simulation engine
	Service Characteristics	Execution
Service Details	Service Provider	Grid Resource Provider
		Supplier: Simulation Service Provider
	Service Receiver	Solution Provider
		Supplier: E-Learning Platform Provider
	Required Resources	Collected data, simulation algorithms
	Minimum Service Level	Coarse grain simulation
	Quality Service Level	Close to reality simulation
Service Subordination	Service Interfaces	Visualization type, simulation type configuration
	Further Service Dependencies	n/a
	Critical Success Factors	Powerful representation of results
Value Chain Details	Supply Chain Coverage	Tiers 4, 5, 6
	Cost Model	Pay per use
	Value Chain Earnings	University

Table 46 Simulation performing service description

Service Discovery Service

Description Area	Description Criteria	Description
Service Basics	Service Name	Service Discovery Service
	Short Service Description	Discovery of services to use in a given context
	Service Goal(s)	Provide the customer with the necessary service
	Service Characteristics	Execution
Service Details	Service Provider	Grid Solution Provider
		Supplier: Meeting Service Provider
	Service Receiver	Solution Provider
		Supplier: E-Learning Platform Provider
	Required Resources	Service tracking database; service description; indexation of services
	Minimum Service Level	Show services available
	Quality Service Level	Powerful context/profile aware searches
Service Subordination	Service Interfaces	-
	Further Service Dependencies	n/a
	Critical Success Factors	Powerful indexation and service description
Value Chain Details	Supply Chain Coverage	Tiers 4, 5, 6
	Cost Model	Fixed tariff
	Value Chain Earnings	University

Table 47 Service discovery service description

Identity Management Service

Description Area	Description Criteria	Description
Service Basics	Service Name	Identity Management Service
	Short Service Description	Identity, authentication, single sign-on, different network providers, portals
	Service Goal(s)	Enable users to roam and transparently connect to the platform independently of their location in a secure fashion
	Service Characteristics	Execution
Service Details	Service Provider	Grid Solution Provider
		Supplier: Identity Provider
	Service Receiver	Solution Provider
		Supplier: E-Learning Platform Provider
	Required Resources	Inter-domain agreements, account linking, profiles
	Minimum Service Level	User authentication backend
	Quality Service Level	Cross domain authentication backend, profile adaptation
Service Subordination	Service Interfaces	-
	Further Service Dependencies	n/a
	Critical Success Factors	Security, transparent roaming provisioning
Value Chain Details	Supply Chain Coverage	Tiers 1, 4, 5
	Cost Model	Fixed tariff
	Value Chain Earnings	University

Table 48 Identity management description

Session Mobility Service

Description Area	Description Criteria	Description
Service Basics	Service Name	Session Mobility Service
	Short Service Description	Provide seamless session mobility
	Service Goal(s)	Adapt session to changing context, redirect sessions to most suitable devices based on context and service discovery
	Service Characteristics	Execution
Service Details	Service Provider	Grid Solution Provider
		Supplier: Session Mobility Provider
	Service Receiver	Solution Provider
		Supplier: E-Learning Platform Provider
	Required Resources	-
	Minimum Service Level	Connect from different locations
	Quality Service Level	Add/remove devices to session, forward session
Service Subordination	Service Interfaces	-
	Further Service Dependencies	n/a
	Critical Success Factors	Seamlessness, usability
Value Chain Details	Supply Chain Coverage	Tiers 4, 5, 6, 7
	Cost Model	Fixed tariff
	Value Chain Earnings	University

Table 49 Session mobility service description

Collaboration Platform Service

Description Area	Description Criteria	Description
Service Basics	Service Name	Collaboration Platform Service
	Short Service Description	Provide platform integrating different services
	Service Goal(s)	Offer an extendable platform for a specific application
	Service Characteristics	Execution
Service Details	Service Provider	Solution Provider
		Supplier: E-Learning Platform Provider
	Service Receiver	Solution Provider
		Producer: Field Trip Grid Solution Provider
	Required Resources	Identity, devices, network provisioning, Grid provisioning, location provisioning, meeting services, …
	Minimum Service Level	n/a
	Quality Service Level	n/a
Service Subordination	Service Interfaces	-
	Further Service Dependencies	n/a
	Critical Success Factors	Integration transparency
Value Chain Details	Supply Chain Coverage	Tiers 4, 5, 6, 7
	Cost Model	Fixed tariff
	Value Chain Earnings	University

Table 50 Collaboration platform service description

E-Collaboration Platform Service

Description Area	Description Criteria	Description
Service Basics	Service Name	E-Collaboration Platform Service
	Short Service Description	Provide e-collaboration platform across domains
	Service Goal(s)	Provide a specific collaboration Platform
	Service Characteristics	Execution
Service Details	Service Provider	Solution Provider
		Producer: Field Trip Grid Service Provider
	Service Receiver	User
		Customer: Student
	Required Resources	E-learning platform
	Minimum Service Level	n/a
	Quality Service Level	n/a
Service Subordination	Service Interfaces	-
	Further Service Dependencies	n/a
	Critical Success Factors	User friendliness
Value Chain Details	Supply Chain Coverage	Tiers 4, 5
	Cost Model	Fixed tariff
	Value Chain Earnings	Student

Table 51 E-collaboration platform service description

Teaching Assistance Service

Description Area	Description Criteria	Description
Service Basics	Service Name	Teaching Assistance Service
	Short Service Description	Evaluate, provide support, create docent plan
	Service Goal(s)	Good student education
	Service Characteristics	Execution
Service Details	Service Provider	Solution Provider
		Producer: Field Trip Grid Service Provider
	Service Receiver	User
		Customer: Student
	Required Resources	Teacher
	Minimum Service Level	Evaluation of work
	Quality Service Level	Close-up, follow up, good assistance
Service Subordination	Service Interfaces	E-meeting resources
	Further Service Dependencies	n/a
	Critical Success Factors	Social leadership, management
Value Chain Details	Supply Chain Coverage	Tiers 3, 4
	Cost Model	Fixed tariff
	Value Chain Earnings	University

Table 52 Teaching assistance service description

Specialized Library Access Service

Description Area	Description Criteria	Description
Service Basics	Service Name	Specialized Library Access Service
	Short Service Description	Provide student with information
	Service Goal(s)	Students' quality work
	Service Characteristics	Execution
Service Details	Service Provider	Content Provider
		Producer: Electronic Project Studies and Researches Provider
	Service Receiver	Solution Provider
		Producer: Field Trip Grid Service Provider
	Required Resources	Specialized documentation
	Minimum Service Level	Documentation
	Quality Service Level	Quality documentation
Service Subordination	Service Interfaces	-
	Further Service Dependencies	n/a
	Critical Success Factors	Quality of information
Value Chain Details	Supply Chain Coverage	Tiers 3, 4, 5
	Cost Model	Fixed tariff
	Value Chain Earnings	University

Table 53 Specialized library access service description

Field Information Collection Service

Description Area	Description Criteria	Description
Service Basics	Service Name	Field Information Collection Service
	Short Service Description	Take pictures, videos, notes, labelling
	Service Goal(s)	Build solid information resources
	Service Characteristics	Execution
Service Details	Service Provider	User
		Customer: Student
	Service Receiver	Content Provider
		Producer: Electronic Project Studies and Researches Provider
	Required Resources	Appropriate devices (e. g. PDA, laptop, camera), voice recognition mechanism
	Minimum Service Level	Write notes
	Quality Service Level	Take notes, label pictures, videos with voice commands
Service Subordination	Service Interfaces	-
	Further Service Dependencies	n/a
	Critical Success Factors	User friendliness
Value Chain Details	Supply Chain Coverage	Tiers 1, 2, 3, 4, 5
	Cost Model	n/a
	Value Chain Earnings	n/a

Table 54 Field information collection description

Field Support Service

Description Area	Description Criteria	Description
Service Basics	Service Name	Field Support Service
	Short Service Description	On the field support by automatically build working groups, contact experts, contact teaching assistant
	Service Goal(s)	Optimize value the student's trip
	Service Characteristics	Execution
Service Details	Service Provider	Solution Provider
		Producer: Field Trip Grid Service Provider
	Service Receiver	User
		Customer: Student
	Required Resources	Available experts, groups; powerful search engine
	Minimum Service Level	Contact teaching assistant
	Quality Service Level	Find and contact a large variety of sources
Service Subordination	Service Interfaces	-
	Further Service Dependencies	n/a
	Critical Success Factors	Powerful search engine, context awareness.
Value Chain Details	Supply Chain Coverage	Tiers 1, 2, 3, 4, 5, 6, 7
	Cost Model	Fixed cost
	Value Chain Earnings	Student

Table 55 Field support service description

Work Evaluation and Study Plan Update Service

Description Area	Description Criteria	Description
Service Basics	Service Name	Work Evaluation and Study Plan Update Service
	Short Service Description	Evaluate student's work
	Service Goal(s)	Allow student to go to next course/phase
	Service Characteristics	Execution
Service Details	Service Provider	Solution Provider
		Producer: Field Trip Grid Service Provider
	Service Receiver	User
		Customer: Student
	Required Resources	Student's work, documentation
	Minimum Service Level	Information
	Quality Service Level	Quality information
Service Subordination	Service Interfaces	-
	Further Service Dependencies	n/a
	Critical Success Factors	n/a
Value Chain Details	Supply Chain Coverage	Tiers 1, 2, 3
	Cost Model	Fixed tariff
	Value Chain Earnings	Student

Table 56 Work evaluation and study plan update service description

Field Trip E-Learning Collaboration Platform Service

Description Area	Description Criteria	Description
Service Basics	Service Name	Field Trip E-Learning Collaboration Platform Service
	Short Service Description	Provide a new type of collaborative and grid sustained study method
	Service Goal(s)	Better skilled students
	Service Characteristics	Execution
Service Details	Service Provider	Solution Provider
		Producer: Field Trip Grid Solution Provider
	Service Receiver	User
		Customer: Student
	Required Resources	E-learning platform
	Minimum Service Level	n/a
	Quality Service Level	n/a
Service Subordination	Service Interfaces	-
	Further Service Dependencies	n/a
	Critical Success Factors	Didacticism
Value Chain Details	Supply Chain Coverage	Tiers 1, 2, 3, 4, 5, 6, 7
	Cost Model	Fixed tariff
	Value Chain Earnings	Student

Table 57 Field trip e-learning collaboration platform service description

University/Student Knowledge Reselling Service

Description Area	Description Criteria	Description
Service Basics	Service Name	University/Student Knowledge Reselling Service
	Short Service Description	Resell knowledge developed and acquired
	Service Goal(s)	n/a
	Service Characteristics	Execution
Service Details	Service Provider	Content Provider
		University/Student Acquired Knowledge Reseller
	Service Receiver	Content Provider
		Electronic Project Studies and Researches Provider
	Required Resources	Work performed in the course
	Minimum Service Level	Raw work
	Quality Service Level	Processed and adapted work with high quality standards
Service Subordination	Service Interfaces	-
	Further Service Dependencies	n/a
	Critical Success Factors	High quality standards
Value Chain Details	Supply Chain Coverage	Tiers 1, 2, 3, 4
	Cost Model	Fixed tariff
	Value Chain Earnings	Electronic Project Studies and Researches Provider

Table 58 University/student knowledge reselling service description

Project Symbiosis Service

Description Area	Description Criteria	Description
Service Basics	Service Name	Project Symbiosis Service
	Short Service Description	Interchange of information and collaboration between projects
	Service Goal(s)	n/a
	Service Characteristics	Execution
Service Details	Service Provider	Solution Provider
		Producer: Field Trip Grid Solution Provider
	Service Receiver	Solution Provider
		Producer: Field Trip Grid Solution Provider
	Required Resources	Collaboration utilities, performed work
	Minimum Service Level	Restricted/poor collaboration
	Quality Service Level	Extensive collaboration and interchange
Service Subordination	Service Interfaces	-
	Further Service Dependencies	n/a
	Critical Success Factors	Platform developed based on recognized standard methods
Value Chain Details	Supply Chain Coverage	Tiers 1, 2, 3, 4, 5, 6, 7
	Cost Model	Fixed tariff
	Value Chain Earnings	Electronic Project Studies and Researches Provider

Table 59 Project symbiosis service description