Bill of Services (BOS): an innovative design tool for service organizations

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Abstract

Organizations must develop services that will meet customers' expectations, requirements, and demands, to be delivered when needed, to the complete satisfaction of the customer. Bill of Services (BOS) is a novel management tool designed to support service organizations in managing effectively their resources. This paper presents a methodology illustrated by real life case for configuration of the BOS in a manner similar to the Bill of Materials (BOM) in manufacturing. Based on the BOS, the necessary resource capacities can be planned and service costing can be calculated according to predefined service levels for each service characteristic.
Keywords: Service design, Resource capacity, Service costing

Introduction

In order to achieve valuable service delivery, service organizations must develop supportive infrastructure so that the process of creating and delivering the service will be accomplished efficiently and effectively. Thus, the discipline of service design becomes a basic element in the development of services. Organizations must develop services that will meet customers' expectations, requirements, and demands, to be delivered when needed, to the complete satisfaction of the customer. Salvendy & Karwowski (2010) discuss the issue of resources capacity while providing services. Excess capacity causes extra costs for workers that are not utilized effectively, while insufficient capacity can cause long customer waiting times. Thus, effective management of resource capacity in service delivery is a major issue that management must address.

The purpose of the paper is to design a management support tool for capacity and cost planning for service organizations. The paper attempts to adapt the Bill of Material (BOM) from the field of engineering design to service development and management. This cross-fertilization between disciplines is important for developing of service science solutions and for fostering service innovation. The integration of engineering and management is particularly relevant for the development of new services. The paper presents the Bill of Services (BOS), a tool for assisting service organizations in developing their services by identifying the resources needed to provide the service and the capacity of each resource. BOS is borrowed and adopted from the manufacturing field, enabling organizations to calculate quantities of the resource capacities needed in order to deliver the service elements emphasized by the service concept (Goldstein et al., 2002). In a similar thought Furrer et. al, (2016), based on research drawn from design science, marketing, and service science propose a new framework for

the design of innovative services that integrates three service disciplines: services, marketing, and design science. Anderson et. al, (2018) present a conceptual paper that answers the question: How do we design service experiences in whole to increase the well-being of all participants in the healthcare system – patients, families, and caregivers? In order to do so, the authors position service design as an essential tool. Yu and Sangiorgi, (2018), Based on a multiple case studies on Service Design (SD) projects; discuss different levels of SD's transformative impacts, associated with three types of designer–client relationships. In the 'delivering' relationship, SD informs service planning and development practices based on user-centred insights, while affecting physical service resources/technologies. Service design is concerned with systematically applying design methods and principles to the design of services. It assumes the customer/user as the starting point or lens into a specific service, and considers how the service can be performed through the use of creative, human-cantered and user-participatory methods models (Holmid & Evenson, 2008). Zeltin & Mandelbaum (2008) have developed a service operations management planning model to assist managers of service organizations in efficient allocation of their resources in order to meet customer demand. Dietrich (2006) reveals that the lack of a standard method for representing resource requirements for business services and resource capabilities used for delivering business services makes it difficult to directly apply the analytic tools developed for manufacturing and supply chains to business services. For conventional goods, each unit of production is typically associated with a well-defined set of resource requirements. In business services, the "unit of sales" is typically a contract describing business functions (e.g. banking services) that will be performed by a provider for a client over a specified period of time; a payment structure; and related obligations of the client and the provider. Exactly how the business functions will be provided, or what resources will be used and when they will be used, should be characterized by the service provider in order to satisfy customer demand on time and in an efficient manner (Dietrich, 2006). Sampson (2012) introduces the Process Chain Network (PCN) Analysis framework for service operations management (SOM). PCN analyzes the complexities of service operations in a systematic way, by depicting services as a specific type of resource/process configuration.

Every day, the media feature stories of customers experiencing how organizations, both private and public, fail to live up to their service promises (Dahl et al., 2012). To suggest a way of overcoming this common phenomenon of service delivery failure, their study introduces the concept of the Service Delivery System. The goal of the Service Delivery System is to understand how to produce efficient service delivery where, service providers are the major participants while still being attractive to customers. This is actually the major issue in service design. How many service providers/resources to allocate such that we won't have waiting times longer than the service levels defined, or, in cases where we have idle service resources. The BOS supports the designer in the process of assigning effective capacities of resources. The BOM is a structured management mechanism that contains all the elements of the product. Product elements should support the product concept. When designing services based on the organization's strategy, the concept developed defines the service categories and characteristics and the service level for each service characteristic. Similar to the BOM, the BOS is a structured management tool that contains all the service elements. Based on the BOS, the necessary resource capacities can be planned and service costing can be calculated according to predefined service levels for each service characteristic. The novelty of the approach is by enabling service organizations to design a detailed structure of the various services delivered to the customer and

derivate the respective resources capacities needed to satisfy customers' needs and expectations. The BOS is a managing tool that allows the service designer to define for each service characteristics various service levels and make the respective cost effective computations in order to verify what should be the appropriate resource capacities.

Gronroos (2000) notes that many of the characteristics applied to services also can be applied to manufactured goods. Johnston (1994) discusses the issue of "Servitization" of operations management, claiming that service organizations may be viewed as the manufacturers of service products. Roth & Menor (2003) discuss the total service concept. Like manufacturing, this is a multidimensional construct that embodies the totality of the service elements that are either important to target customers or are purchased by them. In this article, the focus is on service design with the BOS as a supportive management mechanism to conduct service resources capacity planning and to verify service costing.

Methodology

Service Design

Service design is concerned with systematically applying design methods and principles to the design of services. It assumes the customer/user as the starting point or lens into a specific service, and considers how the service can be performed through the use of creative, human-centered and user-participatory methods models (Holmid & Evenson, 2008). Furrer, (2005) states that in order to ensure service quality, the service delivery process should be well-designed and well-organized. The design of a service can have significant impact on an organization's key metrics, including costs, revenue, brand perceptions, customer satisfaction and loyalty, and employee satisfaction and loyalty (Ostrom et al., 2010). A commonly mentioned technique in service design is service blueprinting (Bitner et al., 2008). A typical service blueprint has five components: "Customer actions" include the steps that customers take as part of the service delivery process. "Onstage/visible contact employee actions" are actions of front-line contact employees that occur each time they cross the line of interaction with the customer. "Backstage/invisible contact employee actions" are nonvisible interactions with customers (e.g. telephone calls) and any other activities that contact employees do in order to prepare to serve customers. "Support processes" refer to activities carried out by individuals and units within the company who are not contact employees and that need to happen in order for the service to be delivered. "Physical evidence" means the tangibles that customers are exposed to that can influence their quality perception. In the physical surroundings of a service ("servicescapes"), customer cognition, behavior and experiences are influenced by the following dimensions: ambient conditions; spatial layout and functionality; signs, symbols and artifacts; and service typology and environmental dimensions (Bitner, 1992).

Service Concept

The service concept is the starting point for the development of an operating strategy (Johnston et al., 2012).The service concept defines and characterizes the "skeleton" of the BOS. Drejeris and Zinkeviciute (2010) proposed a model for one stage of the development of a service concept feasibility assessment and designing of a service system. Every idea can be developed by several concepts. The application of the suggested model allows choosing the best concept of a new service.

Service Specifications

Service specifications are an extension of the service concept. The service concept provides a broad description about the service provided, the customer experience and its outcomes. This in turn should either be based on the needs, requirements and expectations of customers, or a perceived future need or desire for it. Service specifications take the elements of the concept and identify the quality factors associated with each. It details the standards to be achieved and the necessary procedures to ensure conformance to this standard (Johnston et al., 2012).

Service specifications are designed using two dimensions: A; Service characteristics define the various service components (e.g. time waiting for the host in a restaurant). They may be defined by time units, tolerance on the time axis, and yield of a service activity (e.g. yield of the admission process in a hospital department). B; Service level is the second dimension of service specifications (e.g. a 2-minute waiting time in a bank versus a 6-minute waiting time). Different service levels require varying resource capacity in order to comply with a given service characteristic. Service specifications are defined to comply with customer expectations, but should satisfy management ability to allocate the needed resource capacities, or in other words, the budget needed to satisfy the service characteristics. In addition, most business services involve a significant labor component. Effective labor resource planning requires defining the attributes used to categorize human capital, modeling the role of social capital, and analyzing the value of flexibility within organizations and workforces (Dietrich, 2006).

The General Structure of the BOS

With the BOM, the final product is the basic starting point which occupies level "0." For services, level "0" is the organization itself – although it could also be the department/service category under consideration. This is explained below. As our example, let us consider the library of an academic institute-level "0" (any service organization would do). The library's level 1 BOS is presented in Figure 1.

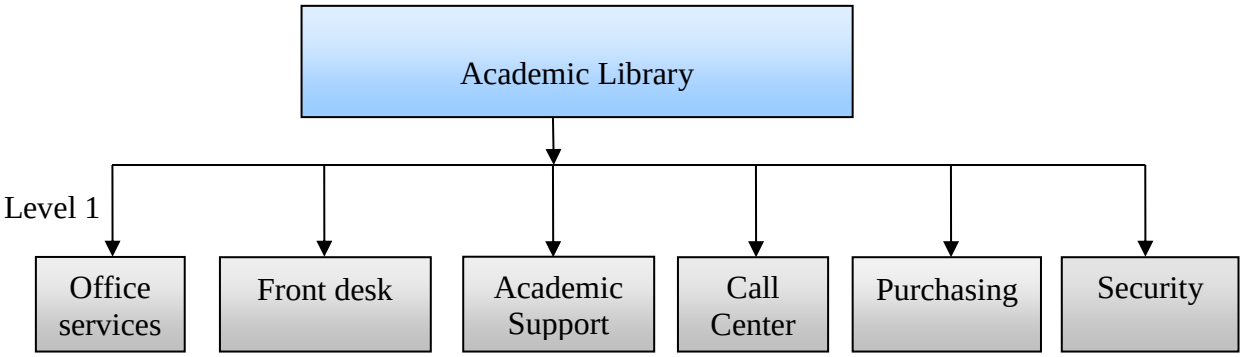

Figure1. The academic library level 1 BOS

Figure 1 shows the Academic library at level 0 (the service organization). Level 1 (service category) includes the service categories provided by the library: *Office services*: Copying, Scanning, Printing, Computer station; *Front desk*: Loan and return books, shelf search support, interlibrary loan; *Security*; *Academic support*: Library

search training, library data bases search; *Phone call center*: academic support, administration issues; *Purchasing*: academic staff requests, syllabus requirements. For each service category, service characteristics are assigned. Figure 2 details the service characteristics for each service category. Service characteristics construct the level 2 of the BOS. As an example: For category *Front desk* (level 1), the service characteristics are: Loan and return books, shelf search support, interlibrary loan (level 2). For each service characteristic in level 2, we then assign the service level. As an example, the front desk is opened Sunday to Thursday between 08:00-20:00 and on Friday between 08:00-13:00. Given the duration of performing a given service characteristics and the arrival rates of the customers and resource capacity the BOS calculates the customer's *waiting time* and the service provider's *idle time*. It supports the goal of any service organization to operate effectively by minimizing service provider's idle time while achieving the defined service level.

Resources Capacity Planning

Resources are the capabilities (tangible and intangible) of the service provider that must be in place in order to provide a service. Service provision is usually the availability, on a limited time basis, exclusively or shared, to the consumer of a resource belonging to the provider. Sometimes, offering a service mainly involves combining the supplier's own resources with those of third parties (Karakostas & Zorgios, 2008).

Capacity is the ability to deliver services over a particular time period. Capacity is determined by the resources available to the organization in the form of facilities, equipment, and labor (Fitzsimmons et al., 2014). A major target of any business organization is to create an optimal resource capacity, such that the derivative costs are minimal but the customer receives the expected service level. Implementing the BOS as a regular management mechanism may support the achievement of optimal resource capacity.

After all service specifications are defined and the service tree is formulated, we may derive the resources capacity needed for complying with the BOS. For a given service specification (a given checklist), we may run simulations with different service levels as independent variables and resource capacity as dependent variables. Thus, the BOS supports the management in the decision related to capacity planning.

We will illustrate this with a simple example. When we observe the Front Desk Services and focus on Patient Loan/Return Services we may calculate the capacity needed to maintain a given service level. For an arrival rate of 10 students per hour with service duration of five minutes and a working day of 10 hours we would need 500 minutes of a librarian.

The same procedure is repeated in order to verify the necessary capacity of all the resources associated with all the service characteristics defined in the BOS. Finally, the BOS summarizes the total capacity of all resource types, thus supporting the library management in the decision regarding total capacity of employees and facilities/equipment needed for a given BOS.

Service Costing

For a given BOS, we may calculate the service cost based on the resources allocated to fulfil the service characteristics and the related service levels. To do so, we multiply the working hours of the various employee types by the hourly rate. Thus, the BOS supports management by aiding the costing process. Using the example of Library front desk services we may calculate the respective costs.

A detailed illustration of a BOS application

Figure 2 presents a detailed BOS for an academic library showing all categories and service characteristics illustrated in the BOS structure. In level 0, we define the library as the service organization. Level 1 presents the service categories: *Office services, Front desk, Academic Support, Call center, Purchasing, Security*. We may then develop each category further, adding more levels as needed according to the service characteristics.

Table 1 detail the service characteristics (level 2 of the BOS) for each service category, defines the service level with the relevant responsiveness and calculates the total capacity needed for each service characteristic. .

This detailed example illustrates four steps of a generic methodology for defining the capacity of the various resources utilized when providing services:

a. Define the service categories that the organization supplies (level 1).

b. For each category define the detailed characteristics of the services (levels 2, 3….).

c. For each service characteristic, define the service level/responsiveness (considering varying demand levels depending on time of the day, day of the week, or season).

d. For each service type, calculate the resource capacity (work force, equipment and technology) based on the service characteristics, the required service level and the demand.

Once management constructs a BOS, they may use it to run simulations to verify the quality of services delivered (e.g. waiting time) for a given resources capacity or the resource capacity needed (e.g. idle time) to achieve a given service strategy.

BOS Example

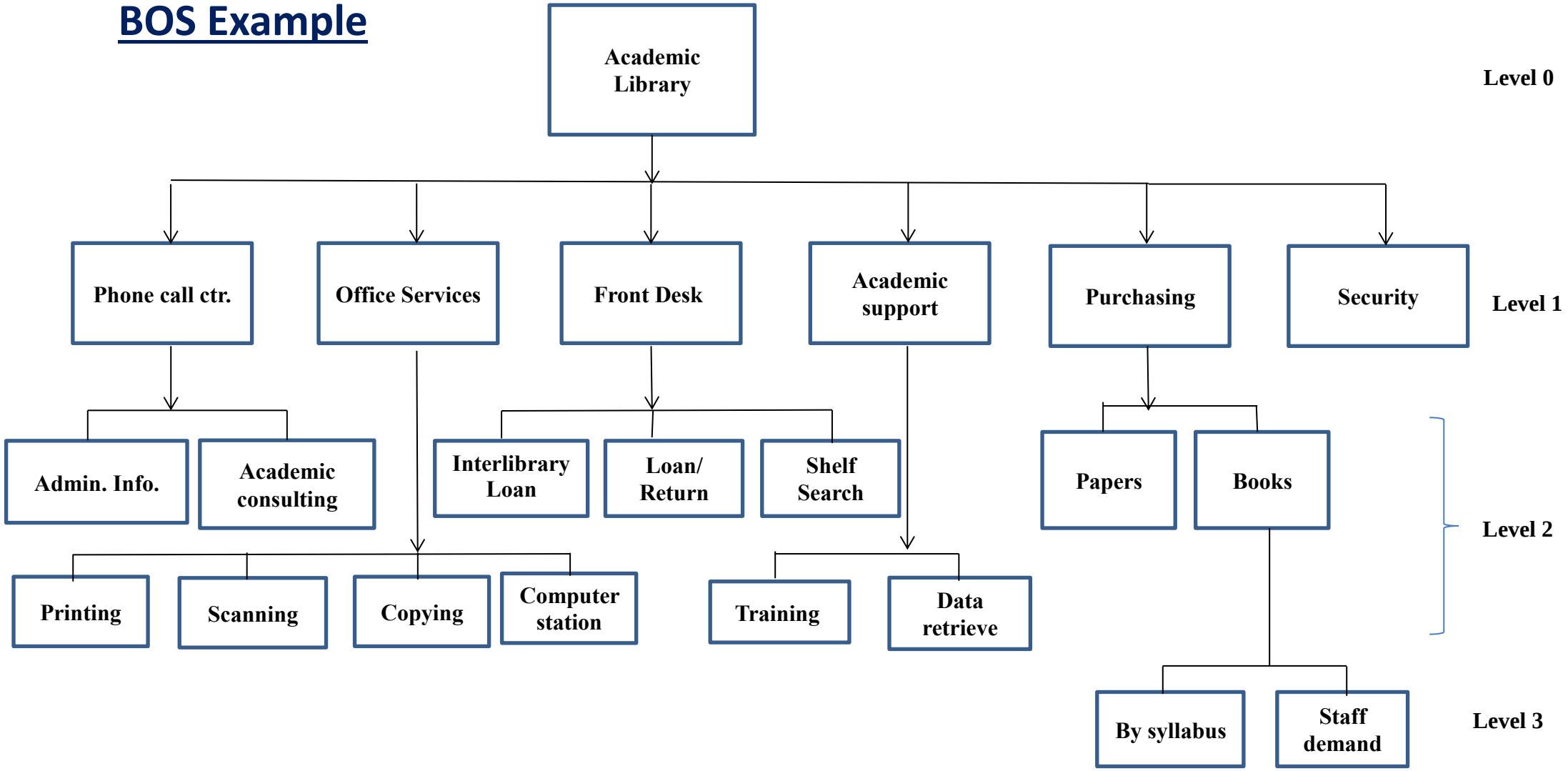

Figure2. The academic library detailed BOS

Table 1- BOS details for an Academic Library

Service Category / Characteristics		Service Level		Duration [min.]
Service Category	Service Characteristics	Service Level	Responsiveness [min.]	
Office Services	Copying Scanning Printing Computer station	08:00- 20:00	15 7 15 15	5 5 3 60
Front desk	Loan and return books Shelf search support Interlibrary loan	08:00- 20:00	5	3 5 5
Academic support	Library search training Data bases search	08:00- 20:00	Schedule 12	60 15
Phone Call center	Academic support Administration issues	08:00- 20:00	1	4 2
Purchasing	Academic staff requests Syllabus requirements	08:00-17:00	Upon request	
Security		07:00-21:00	On order	

BOS implementation in service organizations

We chose to use a library as our example, but any type of service organization can implement the BOS management tool. These may include educational institutions; hospitals police departments; supermarkets; restaurants; transportation companies: airlines, trains, buses; law firms; banks; government services; municipal organizations; volunteer organizations; and charities. As stated earlier, implementing the BOS method may support management in creating a service delivery infrastructure that ensures the customer gets what he needs, according to his expectations, at the right time and intensity, assuring effective usage of resource capacities (minimum idle resources).

Based on the organization's service strategy, management defines the service concept, and then develops the respective BOS as a step-by-step technical procedure. The strict analogy to a BOM is again relevant here. In manufacturing organizations, a product cannot be assembled without a reliable and accurate BOM. It assures that all the needed components are available at the right time and in the right amount, ensuring delivery to the customer of a specific order characterized by product type, quantity and delivery date. Service organizations benefit similarly through implementation of the BOS, which defines the right capacity for all resources in order to respond effectively to customers demand. As in manufacturing, the service organization may use subcontractors to deliver any or all of the services defined in the BOS.

Summary and conclusions

The major purpose of a service provider is to satisfy customer needs and expectations. Customer needs should create service specifications and characteristics, and customer expectations must be fulfilled by the service level assigned.

Each of the service organizations mentioned above may create its own BOS that will support management decisions regarding capacity planning and costing for a given service specification.

We note that for any service characteristic, the related service level must have a quantitative figure. We cannot define service in relative terms such as "good" or "bad". Rather, service must be defined in terms of compliance (or non-compliance) with service specifications (both service characteristics and related service levels).

To the best of our knowledge, most service organizations do not specify or define written service specifications, related characteristics and the assigned service level for each service characteristic. Without defined service specifications and corresponding service levels, the organization has no professional way to plan and control the services provided to the customer. The result is that the organization must address customer complaints and service recovery activities.

The BOS is a valuable management tool for supporting the development of a reliable and appropriate infrastructure to deliver the right response at the right time to the customer. It is a planning and control mechanism enabling management to run simulations that will produce accurate answers to vital what/if questions. The managerial implications of implementing the BOS are very important for service organizations. It is a methodological and consistent managing tool enabling a professional design of the related services without missing any issue that may damage the service delivery process.

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