Business Process Redesign in the Context of Quality Improvement Practices:

Process modeling for the future state of a business process in the F&B department of a five-star hotel in Vienna

Bachelor Thesis for Obtaining the Degree

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Affidavit

I hereby affirm that this Bachelor's Thesis represents my own written work and that I have used no sources and aids other than those indicated. All passages quoted from publications or paraphrased from these sources are properly cited and attributed.

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Abstract

Business Process Redesign/Re-engineering (BPR) has had far-reaching benefits for an enormous range of manufacturing and service industries. Companies increasingly incorporate various dynamic mechanisms such as BPR to fulfill the current climate requirements to improve the quality of products and services and gain competitive advantages. Although hospitality organizations are not exceptions to this situation, this methodology has not gained any significant momentum in the hospitality industry, and the available academic researches have not accordingly addressed the advantages the BPR methodology can bring for this industry.

Understanding how BPR eliminates underlying problems of a particular business process requires a deep study of that phenomenon. This thesis takes a qualitative approach and conducts observational research over six months to study a breakfast service process of a five-star hotel in Vienna to explore the possibilities of redesign and quality improvement. Furthermore, this paper acknowledges a significant level of complexity around the notion of service quality. Thus, while the thesis focuses on the process-oriented quality improvement practices, at the same time, it reviews the customer-oriented notion of quality and recognizes the subjective nature of social phenomena impacting service quality.

The empirical evidence and causal process analysis indicate three critical factors triggering a chain of problems in peak times. Firstly, the tasks and workstreams are highly sequential, making the process considerably sluggish when the restaurant's occupancy rate remains high for at least one hour. Secondly, the results revealed that the persistence of the communicative barriers causes interrelated issues such as irregular and low-quality interactions and, correspondingly, more delays. Lastly, the findings indicate a degree of inefficiency in the shift management procedure, which produces excessive operational pressure in peak times. Therefore, new process designs attempt to eradicate these fundamental issues by utilizing more robust logic and computer-aided systems.

Keywords: Business Process Redesign/Re-engineering (BPR); Quality improvement; Information technology (IT); Service quality; Hospitality industry

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List of Abbreviations

BPR – Business process redesign/re-engineering

BPMN – Business process modeling and notation

BPA – Business process automation

BPM – Business process management

BPMS – Business process management system

CTQ – Critical to quality factors

CSF – Critical success factors

DPMO – Defects per million opportunities

DMAIC – Define, Measure, Analyze, Improve and Control

ERP – Enterprise resource planning

IT – Information technology

IS – Information system

MIS – Management information system

PPM – Parts per million

RDM – Robust design methodology

SPC - Statistical process control

VOC - Voice of the customer

1 Introduction

In the current competitive climate, contextual changes such as the emergence of a new narrative in the economy or expansion of technological frontiers increasingly enforce a new set of rules that continuously result in new dimensions and dynamic behaviors. Accordingly, process thinking has emerged as a method of investigating phenomena to comprehend the dynamic and "non-linear effects of action under complexity" of such an environment to improve organizational performance (Langley, 2007, p. 273). Therefore, since typical static approaches can not comprehensively address dynamic and shifting factors of the current atmosphere (Langley, 2007), organizations should adopt process thinking and regularly scrutinize their processes for revision and improvement to achieve a high level of competence (Davenport & Short, 1990). As a result, understanding the notion of the business process has become immensely vital, that is, the "coordinated and standardized flow of activities performed by people or machines, which can traverse functional or departmental boundaries to achieve a business objective that creates value for internal or external customers" (Chang, 2006, p. 3). Ultimately, process-oriented improvement practices explore the complex behavior of these business processes in the current multidimensional environment to assess the degree to which they can bring value to customers.

Furthermore, from a dynamic perspective, organizations are required to deploy a solid continuum of innovative practices in the form of process innovation to better their efficiency (Dumas et al., 2018; Kirchmer & Scheer, 2004). Hence, to include both dynamic process-oriented practices and the innovative frameworks, business process redesign [or reengineering] (BPR) emerged from the work of scholars such as Davenport and Short (1990) and Grover and Kettinger (1995). BPR firstly enables organizations, accurately analyzing business processes based upon fundamental factors of time, costs, quality of outcome, and quality of organizational culture. Subsequently, after a thorough analysis, companies deploy "process innovation" mechanisms using computer-aided technologies to transform the typical organizational procedures (Dumas et al., 2018, p. 298) to establish a fundamentally more reliable way of doing things.

On this account, BPR utilizes the enormous power of information technology (IT) as its most fundamental tool to initiate meaningful changes in business processes in order to improve the quality of goods and services (Davenport & Short, 1990; Susanto et al., 2019). IT enables organizations to instantiate a structure in which operational resources, including the business processes and the staff's skill set, more profoundly can capture strategic gain (Attaran, 2003). Therefore, "companies need to develop a new digital infrastructure similar to the human nervous system" (Gates, 1999, as cited in Attaran, 2003, p. 442) to react accordingly to various scenarios because digitalization has become an inevitable reality in the current era and it is the necessary means for successful and efficient organizational operations (Attaran, 2003).

Many scholars have pinpointed successful implementations of the BPR. For instance, Hammer and Champy (2001) report the case of Ford Motor that re-engineered its procurement and accounts payable processes, which reduced the number of people involved from five hundred to one hundred twenty-five and significantly reduced the time associated with these processes. However, despite the dominant presence of process-oriented frameworks such as BPR in manufacturing, service industries have much less utilized these methodologies, considering that their services contribute to sixty-four percent of the global GDP, according to the World Bank (2021). Because there is a common perception within a great portion of the service sector that since a significant number of service processes are not tangible and measurable in the sense that manufacturing processes are, improvement frameworks, specifically those which rely on sophisticated and data-driven resolutions, are not compatible with service processes (Chakrabarty & Chuan Tan, 2007). Therefore, regarding the relatively obscure notion of service quality, scholars such as Grönroos; Parasuraman et al. (1984; 1985), while acknowledging the multidimensionality of the concept, postulated models to explain this concept and facilitate optimum functionality of improvement practices. With that regard and due to limitations associated with the scope of this research, a specific section of this paper explicitly focuses on two of these conceptual models, namely, the SERVQUAL and gap model of Parasuraman et al. (1985), which is one of the most cited papers in the academic environment to illustrate underlying mechanisms and realities of service quality from a managerial point of view. However, following scholars such as Ghobadian et al. (1994), this paper recognizes the flaws and limitations of conceptual models when addressing the social phenomena.

Moreover, regarding the IT aspect of the BPR, Although generally manufacturing organizations deploy IT to facilitate and transform functions, there has been much less focus among service industries to incorporate IT despite the powerful influence of services over the modern economy (Davenport & Short, 1990). Considering that even between service industries, the rate of adopting computer-aided frameworks has not been equal; for instance, the airline industry much earlier than the hotel industry included such frameworks (Nebel et al., 1994). Moreover, still, many small or medium-sized hotels remotely harness the BPR practices, and from a theoretical point of view, relatively little attention has been given to the BPR in the context of the hospitality industry despite the 10.4 percent contribution of this industry to global GDP based on 2019 data (World Travel & Tourism Council, n.d.). That is why some scholars such as Nebel et al. (1994), when identifying this prevailing lack of BPR practices in the hospitality industry, argue that task-centered and departmental views of hotel operations can not bring optimum results anymore and due to the significant presence of competition, demand, and IT over time hotels must adopt BPR practices to correspond accurately to these elements.

Therefore, this paper aims to comprehend a business process of a five-star hotel in Vienna city to uncover its problems and propose a revised version of that process. Based upon a qualitative research framework and six-month observation, the researcher first explores the *breakfast service process* of the hotel's F&B department to illustrate the underlying logic of the process by which it serves customers. Subsequently, after pinpointing the fundamental root causes of the problems, a new process design corresponds to these prevailing defects.

The objective is to propose a robust process design for the future state of the existing process, namely a To-Be process by which this service process can attain an optimum response time under all circumstances, specifically during peak times. Moreover, interdepartmental and intradepartmental communications are intended to be highly accurate and smooth under this BPR-oriented process. The reasons adduced in the analysis section of the paper support the new logic and, lastly, the process models picture the To-Be process in detail and illustrate why it is superior to the existing one (As-Is process).

Accordingly, the researcher initially provides a literary insight into *quality* from two fundamental organizational perspectives: customer-oriented and process-based.

First, the nature of services and the significant theoretical models associated with service quality will be identified from the former perspective. Then, an extensive chapter of the paper explores the process-based nature of two methodologies of RDM (Taguchi's robust design methodology) and Six Sigma that fundamentally transformed the ways organizations seek high-quality results. Furthermore, the BPR discipline and the associated steps within this methodology, such as identification, analysis, modeling, and automation, will be addressed. Finally, in the last section of the literature, the fundamental elements for successful implementation will be pinpointed.

2 Literature

2.1 The Notion of Quality

The first definition of quality refers to the Platonic notion of beauty; from this perspective, the reason a product or a service is perceived as high-quality has abstract characteristics that are not objectively measurable (Ghobadian et al., 1994). Such understanding of the term is connected with the subjective nature of human experiences. The human psyche has an inherent complex character, and the way each individual perceives specific experiences and phenomena is undefinable to an enormous degree. Ghobadian et al. assert that tracing the roots of quality is almost impossible from this perspective; therefore, such a definition has few implications in the real world for organizations.

Another standard definition is a unit-based approach to quality. In other words, quality is measured by the concrete benefits of a service or product (Ghobadian et al., 1994). However, from a service quality perspective, quality has an abstract aspect in many circumstances, and the exact identification of the service features that shape this notion is not feasible (Ghobadian et al., 1994). Regarding this matter, the following example would be clarifying. Hotel A is a small city hotel, and hotel B is a larger hotel that provides guests with two more restaurants and one more bar compared to hotel A. Although hotel A, quantity-wise, has a profile of fewer facilities and services, the customers perceive it as high-quality compared to hotel B. Ghobadian et al. (1994) point out that such a perception exists because an organization like hotel A more profoundly approach guests' needs and offer an enriched service to fulfill those demands despite the hotel's fewer physical facility. Therefore, in most circumstances, the quality is a complex non-linear function of available facilities and resources, and it is not simply understandable by mere observation of distinct facilities provided by organizations.

Exploring these non-linear relationships establishes the ground for achieving more mature qualities such as customer-oriented and process-based quality. Correspondingly, Juran and Feo (2010, p. 4), while recognizing these two fundamental domains of quality, state that all services and products must (a) *satisfy their objectives* [namely customers' needs] (b) "with little or no failures." Therefore, organizations understand quality as an optimum point in a matrix mapped by two axioms: (a) external focus (customers and market) and (b) internal focus (procedures and performance) (Ghobadian et al., 1994; Juran & Feo, 2010); the extent to which organizations fulfill their customers' demands and the degree to which operations are free of defects and malfunctions (Juran & Feo, 2010). Table 1, taken from Juran and Feo (2010, p. 6), briefly describes the meanings of these two axioms. The following sections of the paper review these two notions of quality; process-based quality (internal approach) and customer-centric quality (external approach).

Table 1: "The Meaning of Quality" (Juran & Feo, 2010, p.6)

Features That Meet Customer Needs	Freedom from Failures
Higher quality enables organizations to	Higher quality enables organizations to
♣ Increase customer satisfaction	♣ Reduce error rates
♣ Make products salable	♣ Reduce rework, waste
♣ Meet competition	♣ Reduce field failures, warranty charges
♣ Increase market share	♣ Reduce customer dissatisfaction
♣ Provide sales income	♣ Reduce inspection, test
♣ Secure premium prices	♣ Shorten time to put new products on the market
♣ Reduce risk	♣ Increase yields, capacity
	♣ Improve delivery performance
Major effect is on revenue.	Major effect is on costs.
Higher quality costs more.	Higher quality costs less.

2.2 Customer-Oriented Notion of Quality

From a customer-oriented perspective, quality is “fitness for purpose” (Juran & Feo, 2010, p. 4) which to a large degree means “satisfying customer’s requirements” (Ghobadian et al., 1994, p. 48). Customer orientation is an organizational worldview that emphasizes the significant role of external factors for business performance and competition in the market (Ghobadian et al., 1994; Juran & Feo, 2010; Nwankwo, 1995). Competitiveness in the market requires that the organizations go beyond typical quality levels to create purposeful gaps between themselves and rivals (Ghobadian et al., 1994). Customer-oriented organizations recognize the need for sustainable competitive advantages to create such a gap (Brady & Cronin, 2001). Therefore these types of organizations attempt to predict customers’ demands accurately and appropriately respond to them (Brady & Cronin, 2001) by supplying “superior customer service at every point at which customer and enterprise meet” (Davenport, 1993, p. 32). Hence, those organizations that considerably focus on high-quality services and products gain competitive advantages, more revenue, and in the long run, benefit from a transformative culture that continuously reaches for significant outcomes (Juran & Feo, 2010).

The customer-centric framework is highly appropriate for organizations that provide “high-contact, skill-knowledge-based, or labour-intensive services such as … leisure, and hotels” (Ghobadian et al., 1994, p. 48). Such Customer-oriented organizations craft sophisticated marketing strategies by thoroughly analyzing customers' information, enabling them to deliver the most satisfactory results to these customers and achieve desired organizational outcomes (Brady & Cronin, 2001). Nevertheless, by an unrealistic emphasis on the visible layers of service and customer demands, several service organizations fail to understand the dynamics of organizational factors in the value creation process (Nwankwo, 1995). Correspondingly, although various arguments support the positive correlation between customer orientation and organizational outcomes (Brady & Cronin, 2001; Juran & Feo, 2010), there are considerable gaps in the epistemology of customers’ perception of quality that need to be filled (Brady & Cronin, 2001; Ghobadian et al., 1994). Hence, organizations, especially those in service sectors, should elaborately address the reality of perceived quality; then, they should comprehend the value and effect of internal factors (such as organizational structures and procedures) to achieve more sustainable gains in the long run. The following section addresses service quality and how customers perceive quality. The subsequent chapters dive into different methodologies dealing with internal factors of quality.

2.2.1 Services Quality

2.2.1.1 Strategy & Service Quality

Historically organizations tend to have a reactive behavior, and processes were scrutinized merely for "eliminating bottlenecks and inefficiencies," and the long-term thinking mindset was considerably disregarded (Davenport & Short, 1990, p. 6). Although such reactive approaches become less and less apparent as the dynamic characteristics of the current environment, demand more and more proactive approaches, some organizations, especially in the service industry, still act based on reactive approaches. Since having no proactive strategic plan, these organizations address only a few factors named "hygiene factors" that match the fundamental elements of the satisfactory service that customers expect; If a company disregards these basic requirements, customers most often experience a weak service delivery and their expectations remain unfulfilled (Ghobadian et al., 1994, p. 55). Accordingly, scholars such as Ghobadian et al. (1994) argue that since the passive/reactive frameworks do not provide these organizations a superior edge over the other competitors, at best, they only provide a minimum level of quality. Furthermore, companies applying the reactive method are generally vulnerable to new and unexpected environmental factors and fail even to attain minimally desired outcomes that they initially anticipated.

On the other hand, if organizations regard quality as the primary competitive tool, they can create a significant momentum that differentiates their service and reputation from the other players in the market (Ghobadian et al., 1994). For that reason, the successful implementation of the strategic approach to quality management is connected to an appropriate "understanding of the service quality vantage point (definition and vision), customers' expectations, perceived quality, measures of quality, and generic determinants of quality" (Ghobadian et al., 1994, p. 56). Thus, conceptual models such as the Gap model (see Section 2.2.1.5) help an organization craft a relatively appropriate strategic plan to resolve issues and improve service quality.

2.2.1.2 Characteristics of Services

Services have specific characteristics that differentiate them from products and goods. Several prominent academic papers have acknowledged four of these characteristics; they substantially impact the way customers perceive the quality of services: inseparability, intangibility, perishability, and heterogeneity (Alzaydi et al., 2018; Edvardsson et al., 2005; Ghobadian et al., 1994; Haywood-Farmer, 1988; Ladhari, 2009; Lee et al., 2000; Lewis, 1989; Parasuraman et al., 1985).

2.2.1.2.1 Inseparability

Because of the inevitable presence of customers in the service delivery process, “service outcomes” exist in parallel with the “service process” (Ghobadian et al., 1994, p. 49); namely, service productions are inseparable from direct customer involvement. Nonetheless, there are various services, such as financial services, in which service organizations, to a large degree, are not in direct contact with customers (Edvardsson et al., 2005). The continuous involvement of customers in the service delivery process makes “the production process highly visible and introduces a new ‘production worker’ (the customer) over whom management has little or no direct control” (Haywood-Farmer, 1988, p. 20).

2.2.1.2.2 Intangibility

Services do not possess measurable attributes in the same way that goods do; crucial intangible factors such as *word of mouth* play significant roles in purchase processes (Ghobadian et al., 1994). Most often, customers of services can not sense the services before purchase (Edvardsson et al., 2005), and usually, they can not precisely point out the elements they are looking for in a service (Haywood-Farmer, 1988). In general, services simultaneously contain intangible and tangible attributes; thus, not all are purely intangible (Haywood-Farmer, 1988). A restaurant service is an example of a service that has both dimensions.

2.2.1.2.3 Perishability

There is no possibility of storage (Edvardsson et al., 2005; Ghobadian et al., 1994; Haywood-Farmer, 1988) or “final quality check” (Ghobadian et al., 1994, p. 45; Haywood-Farmer, 1988, p. 20) for services and they must be delivered appropriately at a specific time (Ghobadian et al., 1994). From the service organization's perspective, these layers of perishability usually bring a great deal of uncertainty and further capacity management problems (Edvardsson et al., 2005).

2.2.1.2.4 Heterogeneity

During an extended period, providing a service that always has the same features is considerably challenging; there are numerous factors such as the service provider’s behavior, customer needs over time, and the dynamism of the information flow between parties that substantially impact services’ heterogeneity (Ghobadian et al., 1994). In addition, the subjective nature of people on both sides of services (customers and employees) introduces variation to services, which in many cases makes service process standardizations considerably challenging (Edvardsson et al., 2005). However, in specific circumstances, some level of heterogeneity is required for service customization (Edvardsson et al., 2005).

2.2.1.3 Service Quality Definition

In the service sector, organizations measure quality as the degree to which the service delivery process differs from customers’ expectations; this measurement pinpoints fundamental dimensions of the service quality replicated in different forms in some of the most cited academic resources (Caruana et al., 2000; Ghobadian et al., 1994; Grönroos, 1984; Parasuraman et al., 1985). Ghobadian et al. (1994) illustrate the elements of this measurement in an equation (see Figure 1). Accordingly, “Perceived quality” is the sum of three fundamental factors: (a) “prior customer expectations,” (b) “actual process quality,” and (c) “actual outcome quality.” The extent to which the final results are close or far from the “prior customer expectations” determines customer satisfaction (Ghobadian et al., 1994, pp. 49–50).

$$\text{Prior Customer Expectations} + \text{Actual Process Quality} + \text{Actual Outcome Quality} = \text{Perceived Quality}$$

$$PCE + APQ + AOQ = PQ$$

Figure 1: Perceived quality equation (Ghobadian et al., 1994, p. 49)

Ekinci (2002, p. 199) acknowledge the same equation by distinguishing two schools of thoughts working on this concept: (a) “the North American (Parasuraman, Zeithaml, & Berry, 1985)”, and (b) “the Nordic European (Gronroos, 1984; Lehtinen&Lehtinen,

1991, as cited in Ekinci, 2002)." This paper only reviews the North American school, specifically its Gap model (see Figure 2); as Ghobadian et al. (1994) argue, it has considerable diagnostic power and is immensely helpful for service organizations dealing with service quality problems. Moreover, regarding the process-based view of quality that is the main interest of this paper, the gap model provides valuable insights into the relationship between the quality of processes and overall perceived service.

2.2.1.4 SERVQUAL

SERVQUAL originated from Parasuraman et al. (1985) within the North American academic environment (Ekinci, 2002); it gradually became one of the most discussed scales for service evaluation. SERVQUAL is a scale that enables organizations to measure both customers' expectation level and their perception of quality at the end of the service cycle (Alzaydi et al., 2018; Ghobadian et al., 1994; Ladhari, 2009; Lewis, 1989; Parasuraman et al., 1985). It addresses a broad spectrum of service sectors such as healthcare (Ladhari, 2008) and encompasses five fundamental characteristics of the service quality by which customers evaluate the overall service quality. (Parasuraman et al., 1988, as cited in Ladhari, 2008, p. 66):

- **"tangible":** "the appearance of physical facilities, equipment, and personnel".
- **"reliability":** the extent to which the organization delivers the service based upon prior agreement; "dependably and accurately".
- **"responsiveness":** "the willingness to help customers" and how an organization and its staff respond to consumers' requests.
- **"empathy":** the possibility and the extent of personalized "attention to customers".
- **"assurance":** the staff's expertise and cordiality; the degree to which they create an atmosphere of "trust."

Although many scholars such as Lewis (1989) acknowledge SERVQUAL as a reliable method for service evaluation, various critics questioned its power and validity in different circumstances (Alzaydi et al., 2018). For instance, Carmen (1990, as cited in Alzaydi et al., 2018) found out that SERVQUAL can not be regarded as an all-inclusive scale capable of assessing attributes of all services in distinct sectors. Besides, Carmen (1990, as cited in Alzaydi et al., 2018) notes that one-time data collection can not adequately reveal perceived service quality. Furthermore, Carmen (1990, as cited in

Alzaydi et al., 2018) also realized that as long as customers' expectation level is low, it is more probable that their final perceptions are closer to that expectation level; therefore, in such situations, perceived quality is a function of the expectations.

2.2.1.5 Gap model

In addition to the SERVQUAL scale, Parasuraman et al. (1985) organized the gap model (see Figure 2) in which they highlighted five fundamental gaps that prevent an organization from achieving its desired quality level. In this model, the fifth gap as the primary one (Frost & Kumar, 2000) determines the discrepancy between customer expectations and overall perceived quality (Parasuraman et al., 1985). All five gaps are as followed (Parasuraman et al., 1985, as cited in Ghobadian et al., 1994, p. 56):

- "Consumer expectation – management perception gap (Gap 1),
- Service quality specification gap (Gap 2),
- Service delivery gap (Gap 3),
- External communication gap (Gap 4),
- Expected service – perceived service gap (Gap 5)."

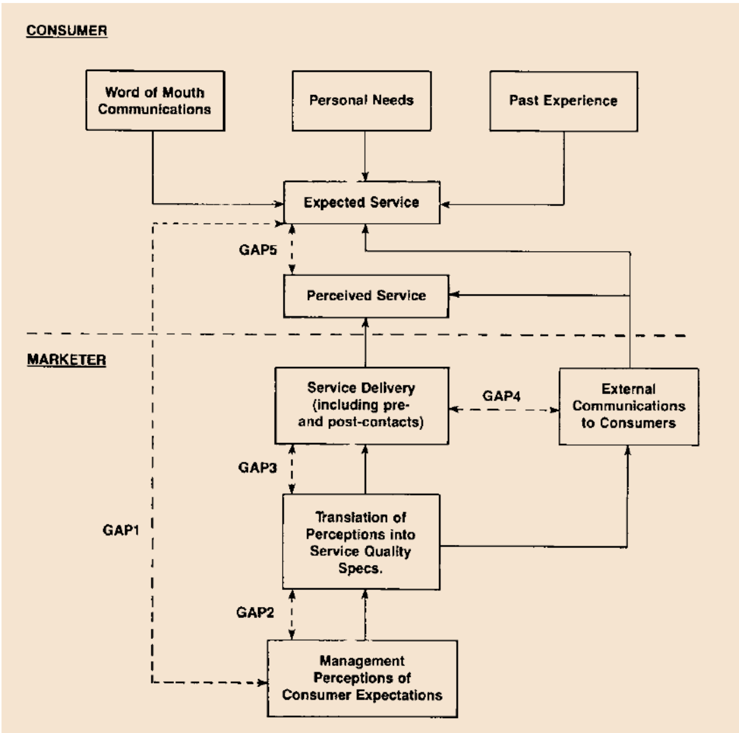


Figure 2: Gap model (Parasuraman et al., 1985, p. 44)

The first gap reveals that high-level managerial positions have a vague understanding of what customers seek in the service and the organization; in these circumstances, the management cannot accurately define the attributes of services(Parasuraman et al., 1985). The next gap refers to situations in which, although the management is aware of required service dimensions, they face challenges in designing appropriate service specifications (Ghobadian et al., 1994). For instance, a restaurant may know they need to provide a high-level service for customers seeking luxurious service; nevertheless, they fail to design a menu that matches customer expectations. The third gap occurs when business processes and procedures are defective, and management pays insufficient attention to internal customers (Ghobadian et al., 1994; Parasuraman et al., 1985). The third gap is of utmost importance from the business process perspective as the following chapters elaborately dive into this concept. The fourth gap determines the extent to which service organizations consider external communication channels (Ghobadian et al., 1994). The marketing strategies and communications should match what service organizations really offer; they considerably affect customer expectations (Parasuraman et al., 1985). Finally, the fifth gap is the function of all previous gaps: "GAP5 = f(GAP1, GAP2, GAP3, GAP4)" and determines if the "service quality is meeting or exceeding what consumers expect from the service" (Parasuraman et al., 1985, p. 46).

Conceptual models attempt to simplify the reality and dynamics of certain phenomena. In the real world, there are a plethora of reasons and elements that affect each other in highly complex ways. As Ghobadian et al. (1994, p. 56) put it succinctly, models are a "simplified description of the actuality". A considerable proportion of the models lie in the subjective realm. Both sides of the service delivery process are humans with subjective and changeful attitudes; this reality imposes significant dubieties on service quality and related attributes (Ghobadian et al., 1994). Hence, there is usually a considerable degree of disagreement in academic and business environments about the practicality and correctness of such models.

The 'quality gap analysis model' like many other similar conceptual models, does not offer comprehensive solutions for a broad range of circumstances; nevertheless, it helps managers with four critical areas of service quality management: (a) comprehensions of service quality's origins, (b) exploring issues that threaten the service quality, (c) tracing the root of those problems, and (d) arrangement of practical solutions (Ghobadian et al., 1994). The quality gap analysis model enables managers to comprehend the defects and dysfunctionalities within the service operation. It provides them well-understood grounds for analyzing discrepancies between fundamental components of service operation (Figure 2) and, more importantly, measuring the overall service quality based on the five fundamental factors mentioned for SERVQUAL. Therefore this model is a strategic managerial tool that enables service organizations to enhance customer satisfaction by focusing on different perspectives of service quality.

2.3 Process-Based Approach to Quality

The process-based notion of quality is what Crosby (1979, as cited in Parasuraman et al., 1985, p. 42) calls "conformance to requirements." For process-based organizations, quality is a function defined by two axioms (a) the well-understood customers' demands (focus is on external elements); and (b) internally well-organized resources, processes, and procedures (Ghobadian et al., 1994; Juran & Feo, 2010). However, they heavily invest in the latter axiom and attempt to provide flawless products and services (see Table 1, right column). This approach, at first, was postulated within the Japanese environment and, over time, created prominent quality improvement movements. As a result of adopting this process-based thinking, in the late 1970s, numerous Japanese companies severely impacted their American rivals by their strong performance and high-quality products; the term "Japanese or Toyota quality" emerged from this situation (Juran & Feo, 2010, p. 71).

Organizations usually accomplish significant market shares when their goods and services are perceived as high-quality (Ghobadian et al., 1994); in the same way, they lose their market share due to low-quality products and services. During the 1980s, the movement initially started in the Japanese market and introduced new challenges for the U.S. market, and notable players of the U.S manufacturing industries faced an enormous struggle in terms of market share loss (Tsui, 1992). American companies started to comprehend the reality that their Japanese rivals increased their products' quality due to more advanced statistical practices such as Taguchi's robust design (Tsui, 1992). According to Tsui, although American companies were utilizing statistical tools before this struggling stage, these tools were primarily aimed at on-line quality control and not the design phase of manufacturing processes. Therefore, American companies realized that in order to survive, they need to significantly change their approach to the market and the notion of quality; models such as Six Sigma that Motorola made are the superior outcomes of that era, and since 1986 they have been dominant frameworks for quality management (Juran & Feo, 2010). Therefore the deployment of methodologies like robust design (RDM) during the 1980s in American companies such as Ford Motor caused an enormous enhancement in these organizations' quality of products and processes (Tsui, 1992).

2.3.1 Robust Design Methodology (RDM)

The robust design methodology (RDM) introduced by Taguchi has been one of the most prominent instruments that facilitated substantial shifts in different industries towards optimum quality improvement practices. According to Taguchi et al. (2004, p. 57), robust design "refers to the design of a product that causes no trouble under any conditions and answers the question: What is a good-quality product?". As Hasenkamp et al. (2009, p. 645) point out, the RDM's objective "is to generate or identify design solutions that are robust, that is, insensitive to sources of unwanted variation or noise factors."

Similarly, Tsui (1992, p. 44) defines the objective of this methodology as making *control factors* of a product or process insensitive to "hard-to-control" elements named "noise." Tsui points out that such insensitivity will be achieved by utilizing sophisticated statistical procedures. Furthermore, Tsui claims that the implementation of RDM results in high-quality, dependable, and inexpensive outcomes. Figure 3 illustrates the objective of this methodology. It is imperative to understand that since noise factors are either considerably complicated or expensive to be controlled (Arvidsson & Gremyr, 2008; Taguchi et al., 2004), the focus must be on the causality of relationships between the fundamental elements and not on the noise factor eradication (Arvidsson & Gremyr, 2008).

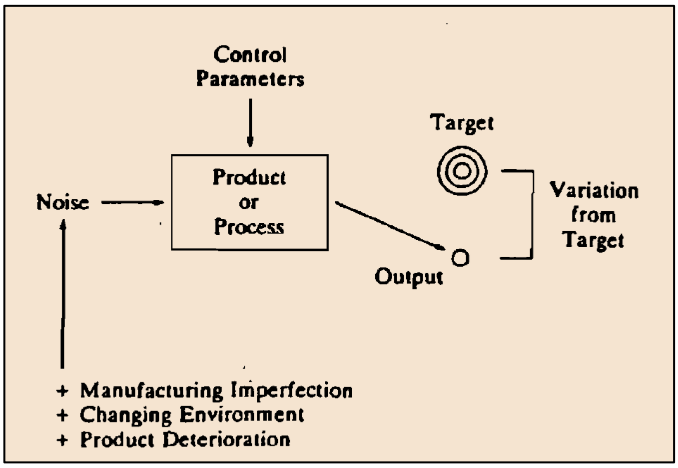


Figure 3: Objective of RDM by (Tsui, 1992, p.45)

Taguchi et al. (2004) explain that a high-quality product or process is fundamentally associated with the pre-design phase when the organization defines specific functions for the products and processes while also connected with the evaluation process, where the functionality is assessed under certain conditions. However, they emphasize the role of pre-design; as Taguchi et al. (2004) put it, “quality or robust design has no meaning” unless it means a specific predefined threshold of functionality (p. 57). Thus, if the entire structure of RDM is based upon vague and oblique references to the organization’s drives and goals, methods may result in facile explanations and fragile outcomes (Hasenkamp et al., 2009). Thus, precisely after a careful and meaningful clarification of those drives, RDM can fulfill its objective. Therefore, as Tsui (1992, p. 46) states, initially, the behaviors and reactions between three primary components of RDM (control factors, noise, output variation) are obscure; however, the RDM team must develop particular experiments through a five-level operation to understand the nature of these elements; figure 4 illustrates these operational steps.

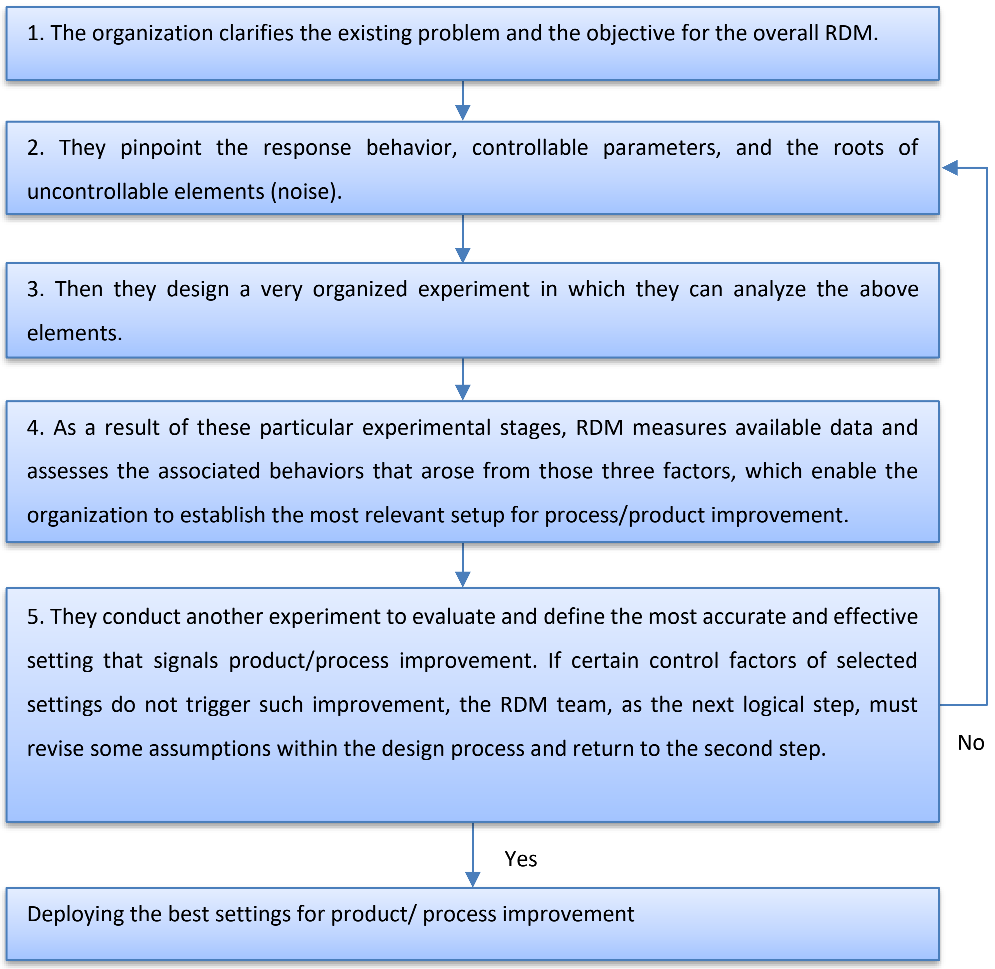
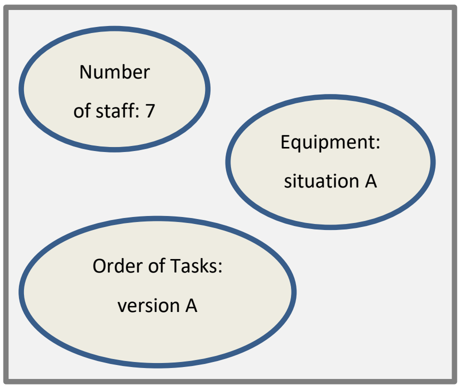
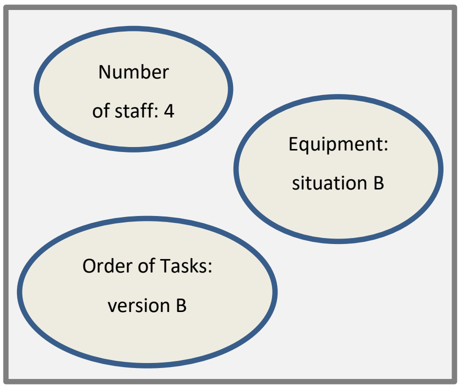


Figure 4: Operational steps of the RDM based on (Tsui, 1992, p. 46)

The following lines delineate and exemplify a circumstance in which a service organization would regard the RDM principles. This example, in more detail, examines the principles above and its main objective is to minimize the variation from a particular target, which has a temporal nature. The problem is that a restaurant under its current settings is not close enough to the target response time during peak times. For process improvement, the following specific combinations of control factors are available (Figures 5A and 5B). For illustration purposes, two *control settings* have been considerably simplified; nevertheless, such settings often represent the organizations' essential resources for controlling service outcomes and achieving organizational objectives. The control factors are (a) the number of staff, (b) the order of tasks, and (c) the availability and functionality of particular equipment. In this example, the uncontrollable factor (noise) is the number of guests seated in the restaurant; guests control the timing of their arrival and presence in the restaurant. Therefore, the noise factor has been determined as the restaurant's number of guests; the occupancy rate.



A: Combination of control factors



B: Combination of control factors

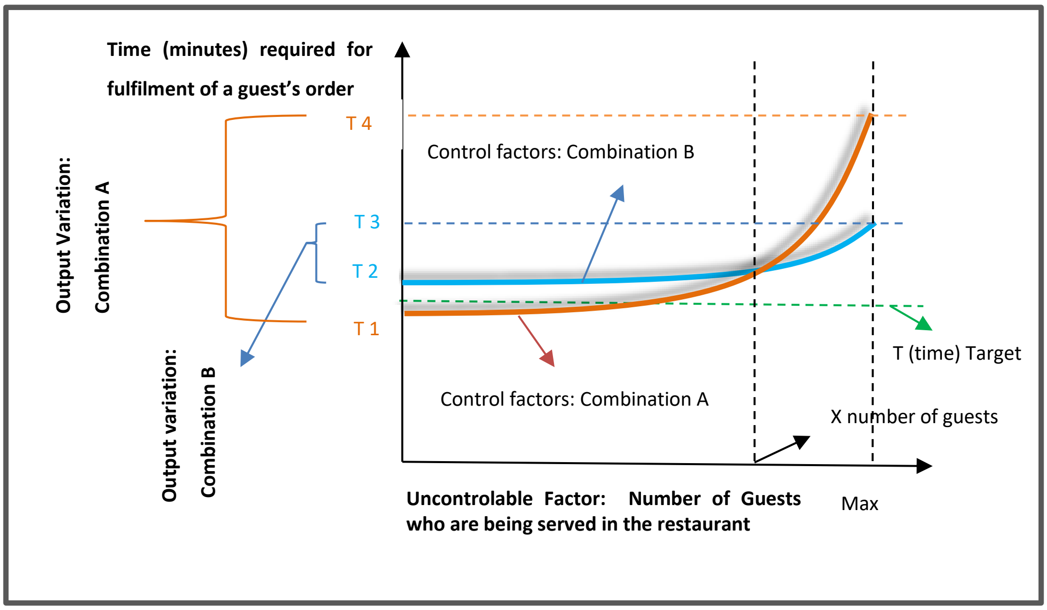


Figure 5: RDM & two examples

Figure 5 illustrates the interconnection between all primary factors in the form of two combinations (within an experimental domain). Here, only the response behaviors of two sets of control factors have been examined; however, in real-world situations, organizations have more sophisticated stakes in the outcome, and more sets of control factors are examined. Based on the illustration, combination A, until a specific threshold is better than combination B and fulfills the guest's order fewer minutes faster. However, this setting starts to respond slower [and probably more stressful] than setting B when the number of guests exceeds a particular range (x number of guests). This significantly weaker functionality of setting A is more of a consideration for management as the combination B has successfully managed to minimize the variation from target despite having less staff (four employees). Such performance indicated that the management team could improve the quality of processes by more intensive attention to (a) the structure of tasks and (b) specific equipment utilization. In this example, the combination of these elements indicates the role of a more effective and robust process. This illustration highlights the RDM's ability to harness the fundamental elements' non-linearly behaviors to effectively and economically enhance the process/product design (Kackar, 1989; Tsui, 1992). Hence, robust design principles provide substantial leverage for quality improvement practices and give organizations salient insight into non-linear relationships between their resources, uncontrollable factors, and, more importantly, their objectives.

2.3.2 Six Sigma Methodology

The six sigma methodology is the product of the era in which many American companies like Motorola started to apprehend the necessity of adopting more sophisticated approaches to recover from their weak market positions in the market which were due to the dominance of high-quality Japanese products over the American goods (Juran & Feo, 2010; Raisinghani et al., 2005). In response to such circumstances, Bill Smith, one of Motorola's significant scientists, organized this framework in which, by utilizing statistical means, processes' defects plunged into a considerable low level and as a result caused "improved customer satisfaction, enhanced quality of service, [and] reduced cost of operations or costs of poor quality" (Antony, 2006, p. 234).

The six sigma methodology initiates a systematic "change process" within the organization (Schroeder et al., 2008, p. 549). It is "a project-driven management approach. … a business strategy that focuses on improving customer requirements understanding, business systems, productivity, and financial performance" (Kwak & Anbari, 2006, p. 708). Correspondingly, it is a problem-solving methodology for "the empirical world" (Mast & Lokkerbol, 2012, p. 607); a methodology with a statistical core and a variety of instruments (statistical or non-statistical) at its disposal that develop quality improvement measures most often based on financial returns (Goh, 2002).

Moreover, this statistical approach to quality management is inherently interconnected with the notion of normal distribution (Chakrabarty & Chuan Tan, 2007; Raisinghani et al., 2005). Accordingly, the six sigma quality level as the goal of this methodology encompasses only 3.4 defects per million opportunities (DPMO) which all fall outside the specification limits of a normal distribution of outcomes, and these limits are defined by six standard deviations above and below the mean (Antony, 2006; Raisinghani et al., 2005). Thus, this quality improvement discipline defines a spectrum of outputs for a given process in the form of normal distribution, pinpointing the desired specification limits, and more importantly, establishes specific measures to decrease the variation around the mean (Antony, 2006). Figure 6 Illustrates these specification limits for a typical process output and a six sigma process output.

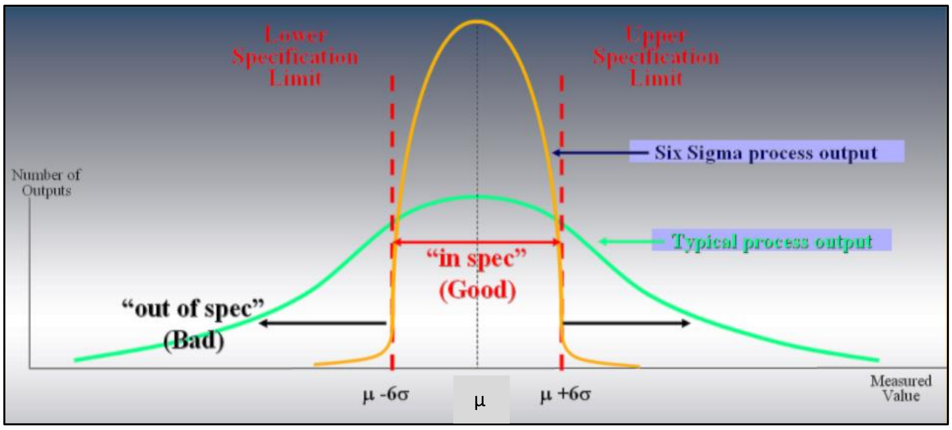


Figure 6: Six Sigma & normal distribution

(TeamReadiness, 2010)

Therefore, this methodology's primary objective is to reduce outcome incongruity and error (Raisinghani et al., 2005); a systematic reduction of variability around the target [mean] (Antony et al., 2007). In general, this objective is significantly similar to the core approach of the RDM discussed above. Moreover, what makes a successful six sigma quality management practice is the careful eradication of the variation's root causes (Antony, 2006), where operations are considerably repetitive, and outcomes must always correspond to a predefined range (Goh, 2002). Table 2 clarifies different quality ranges and their influence on product sales.

Table 2: Sigma level and cost to sales relations; based on "The rise, fall and revival of Six Sigma quality" (McClusky, 2000 as cited in Raisinghani et al., 2005, p. 499)

Sigma level	Defects per million opp.	Quality level (per cent)	Cost as per cent of sales
1	691,000	31.00	> 40
2	309,000	69.00	20-40
3	67,000	93.30	15-30
4	6,200	99.40	10-20
5	230	99.98	5-10
6	3.40	99.9997	0-5

2.3.2.1 DMAIC Framework (Define-Measure-Analyze-Improve-Control)

The six sigma discipline is organized around a structured process encompassing five axioms of Define, Measure, Analyze, Improve and Control (DMAIC) (Antony, 2006; Antony et al., 2007; Goh, 2002; Mast & Lokkerbol, 2012). DMAIC is a meta-process that originated from the statistical mindset of previous frameworks such as Taguchi's RDM and addresses problems with a well-defined nature and objective domain (Mast & Lokkerbol, 2012). According to Kwak and Anbari (2006, p. 709), it is "a closed-loop process that eliminates unproductive steps, often focuses on new measurements, and applies technology for continuous improvement." Therefore, it is relatively accurate to acknowledge DMAIC as a fundamental framework of the six sigma methodology for improving processes at hand. Table 3 describes the fundamental layers of this framework, and figure 7 illustrates the logical relationships between these layers.

Table 3: Fundamental Axioms of the Six Sigma methodology; according to (Antony, 2006, pp. 239–241) and some tools for each step (Pyzdek & Keller, 2010, p. 150)

	Description	**Tools**
Define	• specification of the problem, stakeholders, the process's elements (inputs, outputs, and controllable factors), roles, the project's frontiers, impacts on both internal and external customers A meaningful process mapping can identify the nature and the place of the problem within the existing process. Furthermore, it is imperative to conduct a cost-benefit analysis to assess the financial value of the project.	- Process maps - VOC (voice of customers) tools such as surveys - Benchmarking Pareto analysis
Measure	• performance measurement of the ongoing process using the metrics such as DPMO	- Descriptive statistics - Data mining

	• identifying the CTQ (critical-to-quality) elements, elements that are fundamentally crucial from the customers' eyes • constructing a measurement discipline and defining how-to procedures; these procedures will enable the organization to measure CTQs • benchmarking approaches in order to compare the relatively similar processes [in the relative segment of the industry] • establishing the process's weaknesses and strengths along with a gap analysis	- Statistical Process controls (SPC) & Process behavior charts
Analysis	• The six sigma team discovers the origin and the nature of the defects. • Then they trace any meaningful interconnection between data clusters and start to prioritize those clusters for improvement stages. • Illustrating the patterns allows them to distinguish different variables that have measurable relationships with defects. • They must see the big picture under the umbrella of a thorough financial analysis.	- Process maps - Cause-and-effect diagrams - Hypothesis tests - Simulation
Improvement	• The team establishes a potential spectrum of resolutions. • Then they categorize specific solutions based on their impact on the "bottom-line savings to the organization"(Antony, 2006, p. 240). • Subsequently, they weigh those resolutions along with the relative costs (time and financial wise). • Moreover, they analyze the risks involved with the improvement. • Finally, the six sigma team develops pilot experiments to appraise the benefits of chosen solutions in more depth.	- Simulation - Project planning - Pilot studies - Force field diagrams
Control	The organization creates systematic procedures to preserve the desired quality level and strategic benefits. Furthermore, sustainable quality control is significantly associated with identifying the process owners, their responsibilities, and proper documentation mechanisms.	- SPC - ISO 900x - Cost estimating models - Reporting system

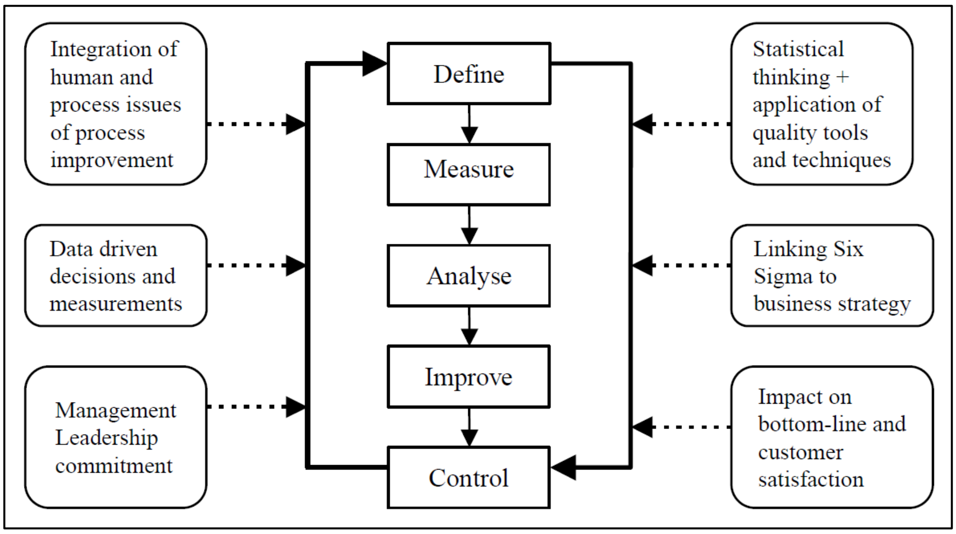


Figure 7: Six Sigma & DMAIC (Antony, 2006, p. 239)

2.3.2.2 Benefits of Six Sigma Methodology for Service Organizations

Despite its significant positive outcomes, many service companies are not convinced to deploy the six sigma methodology(Antony, 2006). Thus, most service processes lead to not better than 97.7 percent acceptable results (associated with the 3.5 sigma quality level) (Yilmaz and Chatterjee, 2000 as cited in Antony, 2006; Antony et al., 2007). Such quality can cause several hundreds of unsatisfactory results (Table 2), leading to considerable financial burdens for companies. An improvement strategy that turns that quality level to four sigma quality will reduce the defects per million (ppm) by 3.7 times and result in a 99.38 percent match with the desired target and, more importantly, substantial financial benefit (Antony et al., 2007).

Service organizations mainly disregard applying the six sigma methodology because most have not yet adopted a statistical mindset which is a powerful means of improvement. Regarding this reality, Antony (2006) argues that such a mindset is necessary to structure the six sigma quality improvement framework in the foundation of service operations. For that reason, Hoerl & Snee (2002, as cited in Antony, 2006) identify its [statistical mindset] principles as follows: (a) operations by nature incorporate a multidimensional arrangement of processes, and (b) these processes always generate variability and data. As a result of Introducing and comprehending these axioms, a sequence of benefits will significantly impact all the organizations. Accordingly, Antony (2006, pp. 236–237) points out the benefits of statistical mindset and, more importantly, the six sigma methodology for service organizations in the following manner:

- A fact-based management style instead of an intuitive one enables organizations to eliminate the costs of biased heuristics.
- The majority of facts and data come from comprehending customers' needs and demands in a precise manner. Therefore, the six sigma framework views the operations from the customer's perspective by establishing elements such as critical-to-quality characteristics (CTQs).
- The well-defined operations enable organizations to utilize resources efficiently, satisfy their shareholders and dominate the market more significantly
- Fast and smooth service delivery due to proper elimination of variation
- Higher employee satisfaction as a result of being adequately educated about skills, tools, and techniques of improvement
- The organization's culture and knowledge start to mature, which results in "proactive thinking" (a must for all teams).

2.4 Business Process Redesign (BPR)

2.4.1 Context

Manufacturing industries long before service industries understood that to remain competitive in an environment that constantly imposes various rules on them, the regular revision of organizational processes must be an inseparable part of their operations (Marchand & Stanford, 1995). Additional to this reality, since the 1980s, investing in horizontal organization structures became necessary because the prominent quality management practices of that period, [such as various Japanese frameworks], had established new paradigms that led to a deeper understanding of the business processes (Davenport & Short, 1990; Earl & Khan, 1994). Therefore, the newly designed horizontal structures and process-oriented organizational activities enabled companies to carefully focus on teams, workflows, resources, and intermediaries (Earl & Khan, 1994). As a result, many American companies established highly resilient organizational structures in which teamwork and self-managed disciplines facilitate robust resource management, efficiency and ultimately achieving higher competitiveness (Attaran, 2003). Correspondingly these new structures help organizations to respond rapidly to various contextual shifts and remain relevant and competent in the current era (Davenport & Short, 1990). Thus, Companies realized that the functional and task-based view of the organization could not adequately address the requirements of the new climate and ensure value maximization (Davenport & Short, 1990; Earl & Khan, 1994).

Therefore, by the end of the 20th century, more and more companies adopted sophisticated perspectives based upon process thinking because, as Tsoukas and Hatch (2001, as cited in Langley, 2007, p.272) argue, this dynamic organizational framework could address the reality in its entirety and accurately explore the transformational “role of time,” while static “cross-sectional models” were somewhat capable of doing so. Ultimately, businesses adopted process-based disciplines to (a) become adaptive to shifting environmental factors; (b) promptly react to market and customers’ demands; (c) eradicate unnecessary costs; and (d) deliver significantly more reliable, consistent, and high-quality products and services (Armistead & Machin, 1997).

Furthermore, parallel to increasingly more dominant process-oriented organizational structures in the last decades of the 20s century, from the beginning of the 1990s, information technology (IT), more dominant than in the 1980s, started impacting businesses and enforced new necessities for organizational change. Thus, due to the emergence of Information systems (IS) and the associated management information systems (MIS) [after the 1990s] and during the 21^{st} century, new managerial models enabled organizations "to improve the organization's performance, productivity, and efficiency" (Susanto et al., 2019, pp. 17–18).

In these circumstances, the business process redesign (BPR) methodology emerged to incorporate process-oriented structures and IT. Process-based methodologies meant companies could correspond to the growing need for proactive competition, better customer service, and proper quality improvement initiatives (Earl & Khan, 1994). Furthermore, the same companies that applied process thinking, now by deploying IT, could transform their operations and quality perspective in a more profound way. The level of this transformation is comparable to how "Taylorism" and the scientific management movement, at the beginning of the twenty century, reconstructed the organizational performance (Attaran, 2003; Davenport & Short, 1990) and established new paradigms for the organizations' perception of productivity, "task decomposition and job measurement" (Davenport & Short, 1990, p. 1).

2.4.2 Definition & Objective

Business process redesign/reengineering (BPR) is a "business management strategy" that, based upon the process-based approach to organizational functions and using the power of IT, "achieve a drastic improvement in efficiency … [and] reduce wastage of efforts … to achieve an improvement in performance and revenue" (Susanto et al., 2019, p. 1). BPR is "the analysis and design of workflows and processes within an organization" (Davenport & Short, 1990, p. 1), especially those that no longer attain the desired outcome the strategic plan once projected.

2.4.2.1 Business Process

Business processes constitute the central part of the BPR practice. They are "a collection of activities that takes one or more kinds of input and creates an output that is of value to the customer" (Hammer & Champy, 2001, p. 38); "a set of logically-related tasks performed to achieve a defined business outcome" (Davenport & Short, 1990, p. 4). Thus, business processes are the primary "organizational unit of analysis or frame of reference" for the BPR and business process management (BPM) frameworks and address the most fundamental interconnections between "tasks, roles, people, departments, functions, [and other significant elements to deliver a particular] product or service" (Earl & Khan, 1994, p. 24). Moreover, processes have two overarching attributes. Firstly, they are set to reach defined outcomes for internal and external customers (Davenport & Short, 1990; Earl & Khan, 1994). Secondly, they "are generally independent of formal organizational structure;" therefore, their boundaries may encompass distinguished departments within one (inter-functional) or more than one organization (inter-organizational) (Davenport & Short, 1990, p. 4). Because of what already stated, Davenport and Short (1990, p. 2) argue that business processes as a whole give a significantly more accurate description of business and effectiveness, compared to the traditional and highly obscure notion of business as "a collection of individual or even functional tasks." On the whole, processes are critical organizational resources that determine the nature, dynamics, and purpose of organizational tasks, functions, and strategies (Davenport & Short, 1990, p. 2).

2.4.2.2 Process Owner

Process ownership is an essential part of process redesign practice, specifically during the initial stages of BPR (Laguna & Marklund, 2019). Similar to an organizational unit, processes should have an accountable and authoritative person (process owner) since the lack of such a position leads to inconsistent action behavior at best (Laguna & Marklund, 2019). In addition, the process owners should have an acceptable level of dominance over their processes, and they must have adopted a process mindset before instantiating proper changes (Davenport & Short, 1990). A typical organizational unit manager can be the process owner if the chosen process entirely falls under his or her unit (Davenport & Short, 1990; Laguna & Marklund, 2019). If this were not the case, someone from the upper layers of administration would be assigned to ensure a higher level of authority and confidence dealing with BPR, especially when it comes to more abstract and high-level business processes encompassing whole and several parts of distinguished departments (Laguna & Marklund, 2019).

2.4.2.3 System

The notion of process in many academic resources such as Earl and Khan (1994) has fundamental similarities to the system concept, and system thinking is an inseparable part of process thinking. Correspondingly, a system is “a set of elements that have one or more relationships between them while systems thinking is the process by which one seeks to understand those elements and relationships so as to be able to understand the behavior of the system as a whole” (Kale, 2019, p. 47). Under such a definition, organizational activities can be comprehended by their fundamental constituents: the objects (primarily process actors and operational resources) and the regulative frameworks (Mayer et al., 1995). Thus, in that sense, the “process view of [an] organisation is resonant of the systems view of organisational design” (Earl & Khan, 1994, p. 24).

2.4.2.4 BPR Objectives

The BPR, as a project-oriented discipline, aims to change the processes to ensure strategic gain (Earl & Khan, 1994). In that regard, it seeks fundamental flaws or strengths in critical business processes to redefine new paradigms for performance, amplify the value at the end process and enhance the time required to achieve that gain (Attaran, 2003). Additionally, Grover and Kettinger (1995) point out that BPR transforms stagnant processes to more accurately align them with the organization’s strategic picture of “efficiency, reduced costs, improved quality, and greater customer satisfaction” (p. vii). Similar to previous pictures, Davenport and Short (1990, pp. 6–7) argue that in the context of specific organizational strategic plans, organizations deploy BPR methodology to achieve four objectives as follows:

- “Cost reduction
- Time reduction
- Output quality
- Quality of work life (QWL)/learning/empowerment.”

Furthermore, Davenport and Short (1990) emphasize that usually, parallel optimization of all four of these objectives is impossible. Nevertheless, some studies point out that projects encompassing “multiple ‘strategic’ dimensions such as time, cost, quality, satisfaction and product innovation” most likely achieve success compared to those focused on a single direction such as "cost reduction" (Wade et al., 1993, as cited in Kettinger & Teng, 1998, pp. 93–94). As a general illustration, Davenport and Short (1990) outline a five-step plan for creating a successful BPR practice with well-integrated IT. Figure 8 illustrates these five fundamental steps.

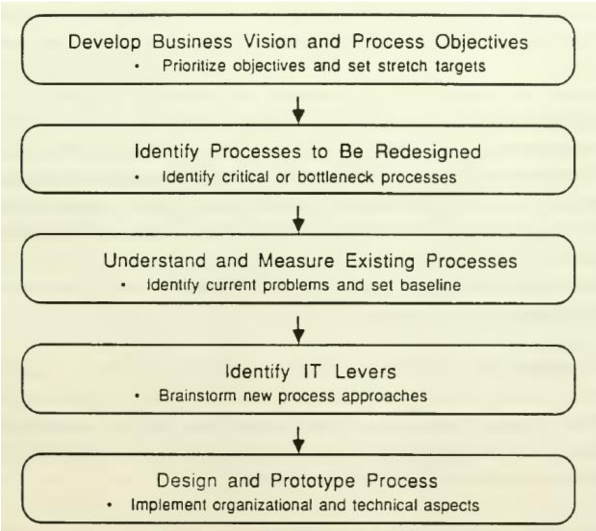


Figure 8: Five Steps of BPR (Davenport & Short, 1990, p. 6)

2.4.3 Strategic Alignment & Process Identification

Most failures associated with the BPR highlight the prevailing lack of strategic alignment with this methodology (Kettinger & Teng, 1998; Tinnilä, 1995). Additionally, scholars such as Hammer and Champy; Tinnilä (2001; 1995) argue that most unsuccessful instances of BPR implementation are related to the fact that organizations only address apparent operative and departmental needs and not transformation around clear strategic goals. For these reasons, before Implementing BPR, organizations should clarify the extent to which process transformation brings strategic value and answer the feasibility questions of BPR projects regarding a specific strategic picture (Kettinger & Teng, 1998). Thus, a comprehensive range of studies should be conducted to clarify the organization's strategy, objectives, strengths while, in parallel, the market's opportunities and threats, customers' perspectives, and market directions should be revealed (Attaran, 2003). Similarly, from a service quality perspective, Ghobadian et al. (1994, p. 56) argue that the successful implementation of the strategic approach to quality management is connected to an appropriate “understanding of the service quality vantage point (definition and vision), customers’ expectations, perceived quality, measures of quality, and generic determinants of quality” (these factors were discussed in the section on Service Quality; Section 2.2.1). On the whole, managers and process owners must understand the current profile of the company, its strategic goals, and the stakeholders; identify the underlying problems of processes; clarify the reasons behind previous success or failures; and organize a plan for all steps of the project at hand (Kettinger & Teng, 1998).

2.4.3.1 Process Identification

Identifying the processes at hand for redesign purposes is an essential step within the overall BPR discipline and is closely related to the strategic plan (Davenport & Short, 1990; Dumas et al., 2018; Kettinger & Teng, 1998). The purpose of this fundamental step is to map out the processes to reveal their constructs, boundaries, and relationships with other processes (Dumas et al., 2018). Thus, this step enables organizations to weigh processes based on their strategic value and severity of underlying problems; then, the management selects those with the most significance (Dumas et al., 2018).

Therefore, organizations either: (a) determine all existing processes and score them according to their strategic magnitude (“exhaustive approach”) or (b) “using a minimum of time and effort” select only “high-impact” processes because they are of utmost importance for current strategic landscape (Davenport & Short, 1990, p. 7). Similarly, Kettinger and Teng (1998) point out the exact mechanism for identifying processes under two categories of “comprehensive” and “targeted” (p. 98); the former corresponds to the *exhaustive approach,* and the latter method is in accord with the *high-impact approach.* Correspondingly, Davenport (1993) more elaborately pinpoints five primary activities for process selection:

- “Enumerate major processes
- Determine process boundaries
- Assess strategic relevance of each process
- Render high-level judgments of the ‘health’ of each process

- Qualify the culture and politics of each process" (p. 27).

Furthermore, Davenport (1993) argues that the success and effectiveness of process redesigns are mainly dependent on the scope of the desired result, thus the scope of process identification. For example, if the organization requires a critical change and improvement in operation, then a comprehensive approach to all processes is necessary. According to this scenario, processes with broad boundaries are reasonable candidates for achieving dramatic change, although because of such an approach, organizations often anticipate a higher level of problems attached to process analysis, process measurement, and managerial implications (Davenport, 1993).

Since not all companies have enough resources to study and transform all existing processes, the *high-impact* [or targeted] approach is a significantly more preferable pathway to process redesign (Davenport, 1993; Davenport & Short, 1990). For that reason, Davenport and Short (1990) claim that the "80-20 philosophy" is a practical approach for those organizations that consider *high-impact processes* for the redesign (p. 11). Moreover, the most practical approach to process selection happens when companies start from fewer key processes and allocate resources accordingly; in that case, the acquired skills and experience acquired in the initial project create reliable milestones for future innovative attempts (Davenport, 1993). Nevertheless, some studies indicate that if BPR projects aim to redesign few processes in a limited organizational scope, less likely to bring meaningful values for those organizations than when projects broaden the scope of the redesign (Kettinger & Teng, 1998).

2.4.4 Process Analysis

When the *exhaustive* or the *high-impact* approach is chosen for process identification, process analysis addresses the nature and level of analysis. Since the architecture of processes in an organization indicates a high level of complexity, a well-ordered representation of processes using categorization methods is necessary (Dumas et al., 2018). Accordingly, to picture the complexity associated with the process analysis, Davenport and Short (1990, p. 15), in a broad picture, categorize processes based on three fundamental elements: entities, objects, and activities; Table 4 describes these categories. Comprehension of the relationship between these factors is of utmost importance when organizations think of process analysis.

Table 4: "Types of Processes" (Davenport & Short, 1990, p. 15)

Process Dimension and Type	Typical Example	Typical IT Role
Entities		
Interorganizational	Order from a supplier	Lower transaction costs; eliminate intermediaries
Interfunctional	Develop a new product	Work across geography; greater simultaneity
Interindividual	Approve a bank loan	Role and task integration
Objects		
Physical	Manufacture a product	Increased outcome flexibility; process control
Informational	Create a proposal	Routinizing complex decisions
Activities		
Operational	Fill a customer order	Reduce time and costs; increase output quality
Managerial	Develop a budget	Improve analysis; increase participation

Furthermore, according to Davenport and Short (1990), process analysis has a two-fold rationale. First, if underlying problems are not revealed and comprehended, the problems will reappear over time; second, by measuring and analyzing the problems and their causes, organizations can organize references by which they can define improvement objectives (Davenport & Short, 1990). Therefore, BPR must have a clear objective about the frame and procedure of the process analysis (Davenport & Short, 1990; Mayer et al., 1995). These objectives explain the organization's qualitative or quantitative process analysis methods (Mayer et al., 1995).

2.4.4.1 Process Classification

2.4.4.1.1 The Level of Resolution

Slack and Brandon-Jones (2018, p. 13) illustrate processes from three fundamental standpoints (Figure 9): (a) "supply network," which is the overall harmony of all operations; (b) operative level, which refers to all processes nested in a specific operation; and (c) single process view, indicating all resources within a process. This three-level view of processes provides a bigger picture by which an organization can choose the highly abstract or high-resolution frames to correspond to its strategic requirements. For instance, from a single process view, the analysis has more operational weight than strategic, and the process is investigated for its variety of resources and their direct impacts on the process's outcome (Slack & Brandon-Jones, 2018).

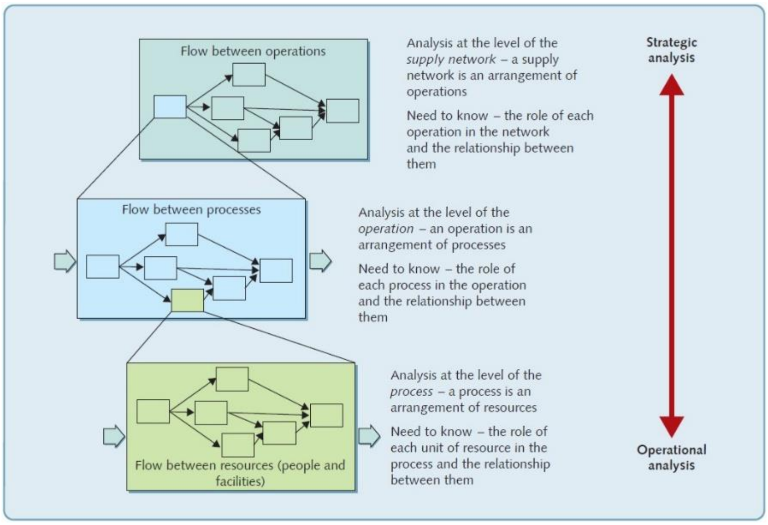


Figure 9: Three levels of process analysis (Slack & Brandon-Jones, 2018, p. 13)

2.4.4.1.2 Primary and Secondary Processes

Earl and Khan (1994, p. 25) illustrate processes in a matrix constructed by two primary axioms of "structuredness" and "value chain target." Figure 10 illustrates Earl and Khan's (1994) matrix of process analysis. The more a process is structured, the more logically oriented, and the outcomes are highly predictable and governable (Earl & Khan, 1994). The other axiom, *value chain target,* measures how closely processes bring value to external customers. Thus, *primary processes* are strategic processes designed to project value for specific external customers and illustrate organizations' fundamental abilities and skills to be relevant and effective in the market (Earl & Khan, 1994). On the other hand, the *secondary processes* picture the managerial and administrative activities organized for internal customers to enhance productivity and momentum in the market (Earl & Khan, 1994).

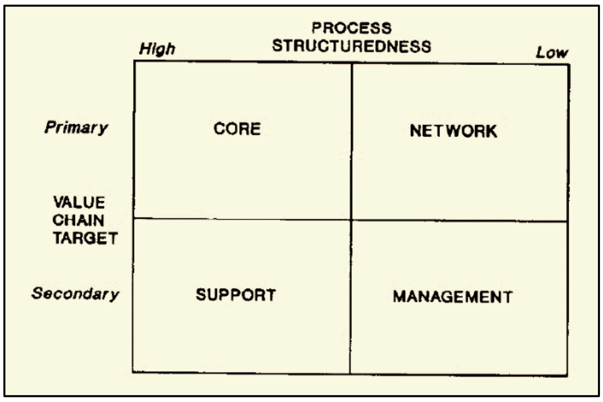


Figure 10: "Typology of Processes" (Earl & Khan, 1994, p. 25)

- A Core process has a critical role in creating value in goods and services explicitly for external customers (Dumas et al., 2018; Earl & Khan, 1994). Accordingly, companies immensely focus on these core processes to improve productivity and enhance their positions in the market (Earl & Khan, 1994). The service process of a restaurant is an example of a core process.
- Support processes are the enablers of the core processes (Dumas et al., 2018; Earl & Khan, 1994) and specifically designed to back internal customers (Earl & Khan, 1994). For example, the process by which an F&B department of a hotel fulfills its required inventories matches a support process. The procurement department usually is the owner of such a process.
- Network processes refer to inter-organizational processes whose boundaries are beyond the primary organization (Davenport & Short, 1990; Earl & Khan, 1994). For instance, a procurement department is highly involved in inter-organizational network processes to supply the inventories that internal departments require. (Davenport & Short, 1990).
- Management processes are regulative processes that control dynamics available in the support and core processes (Dumas et al., 2018). Under managerial processes, the organization can "plan, organise and control resources" (Earl & Khan, 1994, p. 21).

2.4.4.2 Process Analysis Frameworks

2.4.4.2.1 Qualitative Causal Analysis

A fundamental and significantly practical means of process analysis is causal analysis. From a causal analysis perspective, the BPR team (a) pinpoint the system's cause and effect patterns often tied to the systems' control parameters; to (c) understand the causal relationships that prevent the system from achieving its objective (Mayer et al., 1995). The cause-and-effect diagrams such as Ishikawa Diagrams (Dumas et al., 2018; Gitlow et al., 1989, as cited in Mayer et al., 1995) are considerably helpful qualitative methods in this regard.

Ishikawa claimed that "the basic tools of quality control [such as diagrams] tackle more than 80 per cent of quality or process related problems" (Ishikawa, 1986 as cited in Antony, 2006, p.241). However, the more detailed analysis is, organizations and BPR teams can more accurately anticipate the outcomes of the processes. As a result, the relationships can be understood in terms of system factors and their quantitative impacts (Mayer et al., 1995). In this regard, statistical methods such as RDM (see Section 2.3.1) and six sigma methodology (see Section 2.3.2) are relevant. In addition, simulation is another constructive method of analysis that provides organizations with an immense level of detail in contrast to qualitative causal analyses.

2.4.4.2.2 Rational & Pragmatic Reconstructions

Biazzo (2000) illustrates the overall available approaches to process analysis in a matrix defined by two axioms of strategy and focus and two subsections of "rational reconstruction" and "pragmatic reconstruction" (p. 102) (see Figure 11). While rational reconstruction (process mapping and coordination analysis) is essential for process design, pragmatic reconstruction has a complementary role, and is specifically helpful for understanding underlying organizational culture (Biazzo, 2000). Although the main focus of this paper is the rational reconstruction and, more specifically, process mapping of a core business process, the pragmatic reconstruction is briefly addressed using an example.

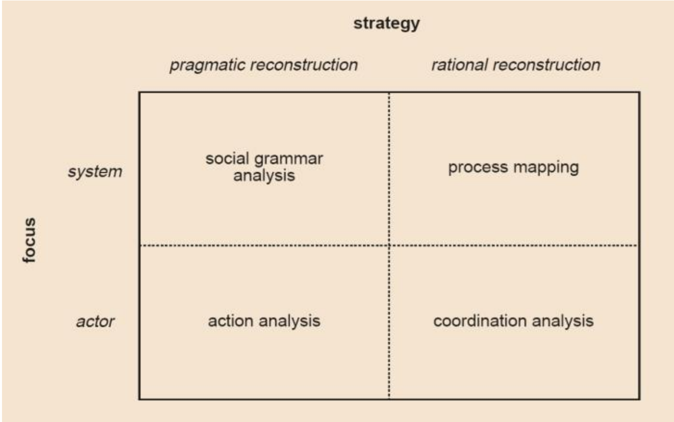


Figure 11: Overall process analysis frameworks (Biazzo, 2000, p. 102)

2.4.4.2.2.1 Rational Reconstruction

A coherent and systematic BPR addresses distinguished internal components where relations between systematic activities are well-understood and governable (Earl & Khan, 1994). In that regard, *process mapping* is one of the primary instruments of process analysis for system analysis. It represents the structure and dynamics of processes by focusing on objects, information flow, employees, and various organizational functions (performed by humans or systems) using graphical models (Biazzo, 2000). Thus, these models illustrate the inputs and outputs of the process (Armistead & Machin, 1997), where inputs match various resources, managerial skills, and operational frameworks (Davenport & Short, 1990).

Coordination analysis looks at the process from the perspective of process actors and the operational context (Biazzo, 2000). From this perspective, according to Biazzo, activities are divided into two forms of *tasks* and *co-ordinative activities*. Tasks are directly related to outcomes, while co-ordinative activities picture "any interdependencies between the various tasks. … [and most often are] information-processing activities" (Biazzo, 2000, p. 104). For that reason, coordinative activities are comparable to support, or management processes discussed earlier (Dumas et al., 2018; Earl & Khan, 1994).

2.4.4.2.2.2 Pragmatic Reconstruction

Action analysis corresponds to the social interactions of process actors that are shaped by three primary structures: "(1) the physical structure; (2) the ritual structure; and (3) the competence structure" (Biazzo, 2000, pp. 106–107). In other words, parallel to structured organizational procedures pictured by rational reconstruction, there are webs of socially defined actions impacted by the organization's culture that ensure designated tasks are accurately performed (Biazzo, 2000). Correspondingly, social grammar analysis studies the underlying constructs (grammar) of these organizational activities and exhibits the possible dynamics and interconnections between them (Biazzo, 2000).

2.4.4.2.2.3 An Example of Pragmatic Reconstruction Based on Biazzo (2000)

For example, a junior waiter's activities in the F&B department of a hotel can be scrutinized when confronting a problem. In this scenario, using the *physical structure* of paging technology, he pages his supervisor or a senior employee. He socially and indirectly has been educated that the question should not be lengthy or about some simple routines that he should have already learned. As a result, the *ritual structure* defines nature and the correct way of asking for help. Finally, the *competency structure* is the rationale behind this act; that is, since the process actor is logically convinced that a more knowledgeable person exists in the organizational structure (Biazzo, 2000), the junior waiter initiates the act of getting help.

2.4.5 IT & BPR

"Information technology (IT) is defined as capabilities offered to organizations by computers, software applications, and telecommunications to deliver data, information, and knowledge to individuals and processes" (Attaran, 2003, p. 442). In general, organizations deploy IT mechanisms to facilitate the accuracy and speed of information flow within the different layers of organizations to improve the momentum of processes and enhance the effectiveness of process management across different points in those processes (Davenport & Short, 1990). Thus, IT enables an organization to decrease operational costs at all organizational levels (Earl & Khan, 1994). Therefore, BPR utilizes the enormous power of IT as one of its primary instruments to initiate meaningful changes in the structures of business processes (Davenport & Short, 1990; Earl & Khan, 1994; Susanto et al., 2019). For that purpose, generally, BPR practices utilize IT capabilities in two forms of databases and networking (Earl & Khan, 1994). Correspondingly, to explain the associated benefits, Davenport and Short (1990) pinpoint nine benefits of the IT-levered design in a Table (p. 12) (Table 5). Then, Earl and Khan (1994) summarize the explanations available in the table provided by Davenport and Short (1990) using technical and economic axioms into a more dense table (see table 6).

Table 5: IT Benefits; taken from Davenport & Short (1990, p. 12)

Capability	Organizational Impact/Benefit
Transactional	IT can transform unstructured processes into routinized transactions
Geographical	IT can transfer information with rapidity and ease across large distances, making processes independent of geography
Automational	IT can replace or reduce human labor in a process
Analytical	IT can bring to bear complex analytical methods on a process
Informational	IT can bring vast amounts of detailed information into a process
Sequential	IT can enable changes in the sequence of tasks in a process, often allowing multiple tasks to be worked on simultaneously
Knowledge Management	IT allows the capture and dissemination of knowledge and expertise to improve the process
Tracking	IT allows the detailed tracking of task status, inputs, and outputs
Disintermediation	IT can be used to directly connect two parties within a process that would otherwise communicate through an intermediary (internal or external)

Databases and information systems provide synchronized and dynamic information flow, ensuring that all actors across different points have a unified understanding of activities and processes (Earl & Khan, 1994). Additionally, networking allows the possibility of “both collection and dissemination of data through a process” (Earl & Khan, 1994, p. 26). Regarding *networking*, Champy (2002, as cited in Attaran, 2003) argues that the underlying technological context of BPR inevitability leads organizations to expand the processes’ frontiers to include all major players and partners such as suppliers and customers. In other words, in the highly technological environment, the only way for a meaningful organizational improvement lies in the necessity of deploying information technology to accelerate the speed and accuracy of business processes across all parties inside and outside of the organization.

Table 6: IT Opportunities In BPR; taken from Earl & Khan (1994, p. 26)

TECHNOLOGY	ECONOMIC SCOPE	PROCESS OPPORTUNITIES
COMPUTATION	Reduce Costs of Production	Automating data dependent tasks Disintermediating information processes Eliminating activities
COMMUNICATIONS	Reduce Costs of Coordination	Collapsing time and space Integrating tasks and processes Distributing and collecting data/ information
'INFOWARE' (Databases and (Systems)	Reduce Costs of Information	Monitoring processes and tasks Analysing information and supporting decisions Archiving and making sense of experience and expertise Modelling and conceptualising processes

2.4.5.1 Three Steps of IT Involvement in BPR Practices

Usually, organizations deploy IT when the processes have already been predefined. However, the evidence shows that if organizations develop an IT mindset from the moment they start planning for BPR, the processes' nature and the associated quality would significantly change for the best (Davenport & Short, 1990). For that reason, Attaran (2003) emphasizes that IT should help BPR practices reconstruct processes ever since the BPR project has initiated; IT is not simply a tool to digitize flawed processes as it may cause further problems. Thus, as an overall guideline, the successful implementation of IT requires three critical steps nested in BPR: (a) pre-design phase, (b) during design, and (c) post-design phase (Attaran, 2003, 2004).

In the initial stage, the organization explores a vast range of possibilities in which IT can bring enormous value to both internal and external customers, those possibilities that accurately correspond to the organization's strategic plan (Attaran, 2003, 2004). Therefore, as Attaran (2003, p. 443) points out, IT's role is like an "enabler" that helps organizations to have meaningful insights into current circumstances and possible future scenarios. For instance, a hotel knowing that it can effectively take room service orders via electronic devices and a digital platform will design the process differently from a typical room service requiring some extra intermediary procedures. Similarly, the same organization can benefit from intranet and internet infrastructures when communicating with its suppliers. Thus, such a hotel can design business processes under a specific structure to fit them into a digital platform to eventually utilize real-time information flow, eliminate time communicating with intermediaries, and increase the accuracy of the information transmitted between all corporate or inter-organizational parties. It is imperative to emphasize that the management's continued support is a fundamental part of this initial phase (Attaran, 2003, 2004).

The second phase of IT deployment happens parallel to process design, and as Attaran (2003, p. 447) articulates, IT plays a "facilitator" role. Accordingly, organizations establish detailed structures to translate all predefined frameworks and concepts discussed in the first phase using two modes of design; "technical design and social design" (Attaran, 2003, p. 447). *Technical design* is a step for creating a detailed map of all processes and their overlaps, defining possible scenarios for process change, and locating the control point in those processes (Attaran, 2004). On the other hand, *social design* is a structure in which organizations address human resources, process owners, skills, tasks, and motives within teams and projects (Attaran, 2003). Two examples of *facilitators* are computer-aided systems engineering (CASE), facilitating process modeling, and simulators that illustrate the mathematical relationships between underlying process constructs.

BPR employs IT in the third stage as an "implementor" (Attaran, 2003, p. 451). When the architecture of processes was eventually complete and procedures were pictured, organizations would deploy IT to align processes and people with the organization's strategic objectives (Attaran, 2003). The primary goal is to examine newly designed frameworks regularly, evaluate performance results and reeducate staff (Attaran, 2003). Project management software is an example of IT as an *implementor*.

Table 7 (Attaran, 2004, p. 587) elaborately addresses IT roles in these three stages. This table is comparable to the Table that Davenport and Short (1990, p. 12) provided in their article (Table 5), while the following table provides more specific details about IT benefits in different stages of the BPR.

Table 7: Description of IT benefits in different stages of the BPR

This table is identical to a table in Attaran (2004, p. 587)

Before the process design	During the process design	During the implementation
• Create infrastructures and manage information that support evolving organization	• Bring vast amounts of information into the process	• Create a digital feedback loop
• Foster process thinking in organizations	• Bring complex analytical methods to bear on the process	• Establish resources for critical evaluation of the reengineered process
• Identify and select process for redesign	• Enhance employees' ability to make more informed decisions with less reliance on formal vertical information flows	• Improve IT processes to meet increasing needs of those divisions that have gone under reengineering processes
• Participate in predicting the nature of change and anticipate the information needs to support that change	• Identify enablers for process design	• Institute a program of "cleanup" and damage control in case of failure
• Educate IT staff in non-technical issues such as marketing, customer relationships, etc.	• Capture the nature of proposed change and match IT strategy to that change	• Communicate ongoing results of the BPR effort
• Participate in designing measures of success/failures of reengineering	• Capture and disseminate knowledge and expertise to improve the process	• Help to build commitment to BPR
	• Communicate ongoing results of the BPR effort	• Evaluate the potential investment and return of reengineering efforts
	• Transform unstructured processes into routinized transactions	
	• Reduce/replace labor in a process	
	• Measure performance of current process	
	• Define clear performance goals and objectives to drive the implementation	
	• Define the boundaries and scope of the process	

2.4.6 Process Modeling

"One can argue that an important reason why humans have excelled as a species is our ability to represent, reuse, and transfer knowledge across time and space" to comprehend "phenomena in a domain at some level of abstraction" based upon structured and consensual models (Krogstie, 2016, p. 18). In the context of BPR, models "portray processes, [and] analyse information, material, work, decision, activity and time flows … to test alternative designs and their impact" (Earl & Khan, 1994, p. 26) "to share our understanding of the process with the people who are involved with it on a daily basis" (Dumas et al., 2018, p. 75).

Moreover, process models provide BPR teams meaningful insights into the structure and logic of processes and signal specific how-to procedures for completing tasks and functions (Polyvyanyy et al., 2015). As a result, process models enable employees to understand the detailed and complex organizational dynamic more straightforwardly (Krogstie, 2016). Therefore, the objective of the business process model is the provision of meaningfully detailed guidelines for a particular task (Polyvyanyy et al., 2015), and the level of resolution (see Section 2.4.4.1.1) is dependent on the strategic and operational need of the organization (Polyvyanyy et al., 2015; Slack & Brandon-Jones, 2018). It is essential to understand that the business process model provides a baseline for improvements in the future; thus, it is not a one-time activity, and in regular intervals, these models should be revisited (Davenport & Short, 1990).

Flowcharts are one of the most practical tools for process modeling. "They graphically depict activities, typically in a sidelong arrangement such that they follow the movement of a job from left to right through the process," and they can illustrate loops, "alternative paths in the process, decision points, and parallel activities" (Laguna & Marklund, 2019, pp. 118–119). There are a variety of standards and languages guiding flowcharting and process modeling. Business Process Model and Notation (BPMN), due to its vast abilities (Silver, 2011), is one of the most increasingly known languages providing both technical and business clients of process models beneficial insights into complex process structures (Rosing et al., 2014). Figure 12 exemplifies a top-level diagram using the BPMN language.

Moreover, it is noteworthy to distinguish between diagrams generated by different information systems (IS) and diagrams illustrated manually; in the former version of diagrams, symbols and graphical illustrations represent the process coded by IS developers (Laguna & Marklund, 2019). Increasingly more accessible business process management systems (BPMS) and platforms such as IBM Blueworks Live provide an extensive set of tools to design automatically executable processes using BPMN language. In these platforms, there is the possibility of graphically illustrating models while the system, in parallel to that, translates the graphical language to computer codes and executable functions. Ultimately, the logically sound coded processes establish a ground for other computer-aided methodologies such as simulation and automation.

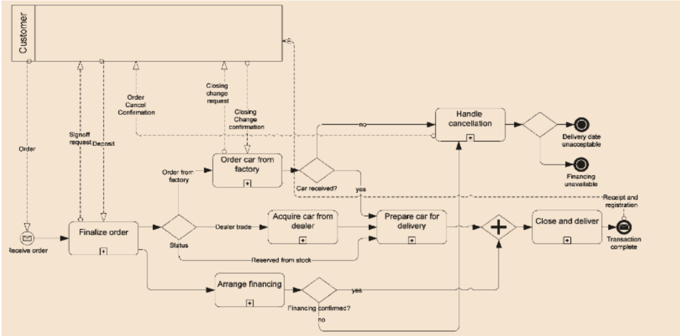


Figure 12: An example of a top-level diagram using BPMN language (Silver, 2011, p. 66)

2.4.6.1 Simulation

BPR project teams utilize the ability of computerized models a further step beyond mere representation purposes, "to simulate and analyse flows, activities, and buffers, and to test likely behaviour of redesigned processes"; as a result of this practice, process owners would be ensured about the most logically possible outcome of the final BPR initiatives (Earl & Khan, 1994, p. 28). A Simulation reveals mathematical and logical relationships between the components of specific systems (Law, 2014). It allows organizations to examine the model, rather than the entire operation, to scrutinize the behaviors associated with a set of process elements during specific operational periods (Krogstie, 2016).

Accordingly, in the context of the exhaustive process identification method (see Section 2.4.3.1), some organizations, by applying computer coding for processes, take process modeling one step further to translate process logics into computer codes which allows computer-aided systems and IS to mathematically and logically calculate various scenarios for operation. Correspondingly, Jeston and Nelis (2008) argue that the simulation methods explore the relevance and effectiveness of implementing a specific process model to demonstrate if the model is logically solid and consistently meets the desired outcome over time (Jeston & Nelis, 2008). Ultimately, a proper simulation enhances: (a) customer satisfaction, (b) productivity, and (c) significantly facilitate modifications in the future when applying specific changes become crucial (Davenport & Short, 1990).

2.4.7 New Processes & Automation

After a thorough process analysis, problems in a specific process or selection of processes will be revealed. The result of the root cause analysis enables the BPR team to brainstorm possible solutions that can eradicate root causes or decrease their impact to a large degree. Accordingly, once the processes have been identified, analyzed, and optimum “conceptual process models” were proposed for redesign, the concrete “executable process models” would instantiate those agreed-upon abstract models as a result of an implementation process utilizing business process management systems (BPMS) (Dumas et al., 2018, p. 371). This procedure allows processes to be tested in a simulation and eventually makes them ready for business process automation (BPA) which is the “computer aided coordination of resources, facilities, and human knowledge to achieve the desired results in a way that the process is optimized” (Mohapatra, 2013, p. 217).

The first step of the preparation procedure is to investigate the possibility of automation for the whole or parts of these conceptual models, as the nature of a process and its compatibility with BPMS determine if the automation is possible and bring an anticipated outcome; the objective, therefore, is to distinguish and examine the limits of the automation for the process (Dumas et al., 2018). Next, it is imperative to check the underlying logic to see if available manual tasks can be turned to automated ones or create a ground where their functionality does not negatively impact the effectiveness of automated ones (Dumas et al., 2018). For instance, logically, not all tasks and functions available in the restaurant service process are appropriate candidates for automation. Furthermore, some tasks are performed entirely by a human actor, while some, such as credit card payment, are partially automated and partially handled manually by employees. As a result of these steps, BPA makes people and employees the real actors of the process, and they are not looked upon as mere human elements of the process (Mohapatra, 2013). Furthermore, flawed loops of behavior and unnecessarily repeating tasks will be removed, and accurate communication across the entire organization will be highly facilitated (Mohapatra, 2013).

Preparing processes for automation requires the BPR team to ensure that the model is appropriately detailed, (neither too abstract nor too elaborate), all the exceptions are mapped, and all automated tasks have proper electronic inputs and outputs

(Dumas et al., 2018). Lastly, Dumas et al. (2018) highlight the fact that the model, to be in the readiness state, should be entirely compatible with the grammar of the modeling language [for example, BPMN], the execution elements of the BPMS of choice [for example, IBM platform] and the organization's enterprise resource planning (ERP) system.

The BPA should not be looked upon as mere digitalization of available manual functions (Mohapatra, 2013) as turning a flawed process into an automated one means "more efficient ways of doing the wrong kind of things" (Hammer & Champy, 2001, p. 51). Instead, it should be considered a robust methodology of the information era that has the ability to transform existing processes into more communicative, accurate, and dynamic ones to replace typically costly and time-consuming workflows with effectual and logically sound processes (Grover & Kettinger, 1995; Hammer & Champy, 2001; Mohapatra, 2013).

2.4.8 Critical Success Factors (CSFs)

In recent decades, organizations have made enormous efforts and allocated significant resources to effect meaningful improvements in organizational performances using BPR practices; nevertheless, only a few have successfully achieved this path (Al-Mashari & Zairi, 1999; Attaran, 2004). Moreover, few organizations are satisfied with the BPR since the evidence shows that most organizations set unrealistic goals (Attaran, 2004). Hence, the successful application of a carefully crafted BPR discipline that rationally manages available resources requires some specific elements. This section reviews these factors, namely the critical success factors (CSFs) and their impacts.

2.4.8.1 Strategic Direction

Organizations should align BPR with clear and quantifiable strategic objectives (Al-Mashari & Zairi, 1999; Attaran, 2004; Mohapatra, 2013; Srinivasan, 2011). The accessibility to particular resources and contexts enables organizations to develop specific competencies that substantially affect their strategic direction and dominance within the market (Armistead et al., 1999). Without identifying strategic direction, competitive advantages, and ignoring customer perspectives, business processes fall into a defective loop that results in neither savings nor qualitative gains (Attaran, 2003). Therefore, before BPR initiation, the organization should assign a team to identify all stakeholders, clarify goals in quantifiable terms (such as financial return or time reduction) and carry out a cost-benefit analysis (Mohapatra, 2013).

Moreover, BPR is not a stand-alone framework for achieving optimum operational performance. The success of the BPR is significantly associated with the proper application of other organizational quality improvement practices [such as the six sigma methodology; see Section 2.3.2] (Attaran, 2004). The purposeful and systematic deployment of other methodologies parallel to BPR can leverage this framework to achieve its strategic goals. Hence, managers should truly understand the concept of BPR to adopt a process-based mindset aiming to restructure organizations around optimum outcomes and not around traditional functional departments (Attaran, 2004). Ultimately, managers in service organizations should also recognize the significance of customer and market points of view; those organizations that set up their systems and procedures around these viewpoints will achieve higher service quality than those that disregard this perspective.

2.4.8.2 Management & People

Robust leadership is a significant determinant of the BPR success (Al-Mashari & Zairi, 1999; Attaran, 2003; Davenport & Short, 1990; Love & Gunasekaran, 1997). Because of "the transformational attribute of BPR" and the cross-functional boundaries of many business processes, organizations require leaders who ensure "commitment, provide resources, oversee the project, be a resolver of conflicts and pursue the superordinate goal" (Earl & Khan, 1994, p. 28).

Moreover, management should evolve because while BPR requires organizations to apply top-down initiatives, managers should also allow a horizontal dynamic within operations to motivate employees to grow their abilities and perform with a level of autonomy (Attaran, 2004). For that reason, Ghobadian et al. (1994) pinpoint the significance of autonomous frontline staff in service delivery processes. Logically, the constant presence of mid-level managers is not possible. If frontline staff is not equipped with trust and an appropriate amount of freedom, customers often negatively experience that service delivery process (Ghobadian et al., 1994).

Davenport and Short (1990) note that most typical organizations usually dictate the instructions because they want to keep an acceptable level of performance within the operation, and they are not keen to change the status quo. However, in opposition to this typical management style, effective management requires an atmosphere and culture that convinces employees that the BPR brings meaningful changes (Al-Mashari & Zairi, 1999), and newly designed guidelines benefit all internal and external customers (Davenport & Short, 1990). For such reasons, organizations implementing BPR practices have started to develop particular programs to empower skilled employees and middle to low-level management, resulting in high-quality dynamics across all departmental units (Davenport & Short, 1990).

The extent to which employees can deal with constant changes and the continuous learning process in an organization is a significant indicator of successful process-based management (Brenner & Coners, 2010). Process redesign requires organizations to conduct proper job evaluations and recognize the importance of training for obtaining a desired set of skills to create a healthy atmosphere in which employees are logically and mentally prepared to react positively to changes (Al-Mashari & Zairi, 1999; Attaran, 2004). Regarding service organizations, Ghobadian et al. (1994) point out the significance of delivering sufficient training opportunities, clear progression paths, and standard performance evaluations. According to Ghobadian et al.'s argument, those organizations that considerably motivate their employees benefit from customers' positive perceptions. This matter indicates the significance of well-trained and motivated employees. Such employees perform their tasks robustly and react accurately in various circumstances.

2.4.8.3 IT Infrastructure

IT infrastructure and IS (information systems) should be in the appropriate readiness-to-change mode (Al-Mashari & Zairi, 1999; Attaran, 2004; Love & Gunasekaran, 1997). "Effective alignment of IT infrastructure and BPR strategy, building an effective IT infrastructure, adequate IT infrastructure investment decision, adequate measurement of IT infrastructure effectiveness, … and effective use of software tools" to a significant degree determine the attainment of the BPR goals (Al-Mashari & Zairi, 1999, p. 95). In many circumstances, process redesign fails since IS structure does not allow fundamental changes; in these cases, constructing a new IS is essential for BPR success (Attaran, 2004).

The necessity of deploying IT in the current atmosphere of the market for both manufacturing and service industries is exponentially getting more apparent. This deployment in two macro and micro dimensions impacts organizations (Love & Gunasekaran, 1997). Love and Gunasekaran identify the macro-level as the extent to which organizations decentralize hierarchies of decision-making and information flows. At the same time, the micro-level refers to the transformational characteristic of IT that changes the nature of a vast range of jobs and increases the enormous need for high-skilled individuals while some other jobs become entirely repetitive and less attractive (Love & Gunasekaran, 1997). Therefore, organizations must find an optimum spot in the matrix created by these two macro and micro axioms; the manner and strategic channel by which organizations find the right paradigm for deploying IT indicate the success of the BPR. On the whole, organizations must harness IT capabilities to align with their strategic perspectives, facilitate the maturity of organizational culture, and help people grow within that structure since "in a mature organization, employees grow with organizational successes" (Goh, 2002, p. 409).

2.4.8.4 Barriers in The Context of The Service Industry

Problem identification is of utmost importance for service sectors when they address quality measurement procedures. In many circumstances, despite errors in the service delivery processes and, more importantly, despite customer dissatisfaction, service organizations are not mindful of these red flags (Ghobadian et al., 1994). Moreover, Ghobadian et al. address that customers experience services through different stages of the service delivery process. Accordingly, Ghobadian et al. (1994) highlight an inevitable complexity when service providers attempt to associate specific problems with a particular stage. There is usually a significant amount of uncertainty, and due to intuitive normative management, thresholds of the processes are considerably vague compared to manufacturing processes (Antony et al., 2007). Therefore service organizations need to establish clear elements upon which the service performance is measurable.

Time is another crucial determinant of achieving proper improvement outcomes for service organizations. Ghobadian et al. (1994, p. 46) argue that service quality to a more considerable degree is a function of the "people" and "attitudes," not "systems." The inevitable existence of uncertainty resulting from the subjective nature of the people on both sides of the service delivery processes (internal and external employees) requires service organizations to spend a significant amount of time and energy to overcome certain deficiencies and errors (Ghobadian et al., 1994). Hence, Service organizations, substantially more than manufacturing companies, should be realistic about the projects' scope and outcomes.

3 Methodology

3.1 Research Design

This study aimed to discover elements of a specific business process (the breakfast restaurant service process of a five-star hotel in the first district of Vienna city (hereafter referred to as Wien-Five-Star or WFS Hotel), identify the process's underlying problems, finding the root causes of these problems, and propose a redesigned version of that process for BPR and automation purposes. The research design is constructed based upon qualitative data collection and data analysis as by using qualitative methods, a researcher can profoundly investigate specific phenomena or behaviors without reliance on typical classifications (Hair, 2013). First, data was collected through evidence-based process discovery methodology (Dumas et al., 2018), namely the observation and document analysis. Then the process was modeled in the form of an As-Is process (Dumas et al., 2018; Mayer et al., 1995).

When dealing with a specific sample or phenomenon, or a business process, observation enables the researcher to gather information in an elaborate way (Hair, 2013). Accordingly, the researcher closely observed the breakfast restaurant service during a six-month internship in the WFS hotel's F&B department. As an active observer, the researcher could be part of the organizational steps initiating or facilitating the process; such a position enabled him to understand the process's boundaries and critical control points (Dumas et al., 2018). Moreover, in contrast to document analysis, observation enabled the observer to see the process from a realistic perspective and not a theoretical one (Dumas et al., 2018).

For this research, besides observation, available documents facilitated the understanding of the process; such documents significantly help a process analyst get familiar with regulations, policies, and other beneficial information. Nevertheless, Dumas et al. (2018) argue that logically, a process analyst should not entirely rely on these documents due to three possible obstacles. First, the fact that, usually, these documents are not organized based on a process-based model of thinking. The second hurdle is that these documents are either too detailed or too abstract. Lastly, it is imperative to realize that many organizational documents are outdated or idealistic; they can not represent the daily routines. Thus, these documents were not considered the baseline for analysis in this paper.

3.2 Qualitative Process Analysis

The degree to which qualitative research achieves its objectives not only a function of direct contact with people involved but also, in a more profound manner, depends on "building rapport and demonstrating sensitivity to gain cognitive access to their data" (Saunders et al., 2019, p. 179). The researcher constructed such rapport with WFS hotel's staff, especially with the F&B staff, the actors of the studied process, as he worked full-time as an intern in that department. A six-month internship allowed the researcher to understand and analyze the process from both *rational reconstruction* (see Section 2.4.4.2.2.1) and *pragmatic reconstruction* (see Section 2.4.4.2.2.2) points of view (Biazzo, 2000). However, the primary concern of this paper was process mapping and the causal analysis of the breakfast restaurant service process (the core process) and some support processes (for process classification, see Section 2.4.4.1).

The researcher conducted a qualitative causal analysis for finding the root causes of problems (Dumas et al., 2018; Krogstie, 2016; Mayer et al., 1995) using the Ishikawa diagram (Dumas et al., 2018; Mayer et al., 1995) and the Why-Why diagram (Dumas et al., 2018, pp. 241–243) to understand and report the underlying causes of the process's problems. First, the Ishikawa diagram is divided into four categories of causes, namely the 4 P's: "Policies, Procedures, People and Plant" (Dumas et al., 2018, p. 239) in which sub-categories represent "primary factors … that have a direct impact on the issue at hand, … [and] secondary factors, which are factors that have an impact on the primary factors" (Dumas et al., 2018, p. 239). Subsequently, the primary and secondary factors are investigated elaborately in the Why-Why diagrams.

3.3 Business Process Modeling

Regarding the "typology of processes" (Earl & Khan, 1994, p. 25), the primary focus of the researcher has been on the redesign of the core business process (the breakfast service process provided by the F&B department of the WFS hotel) and some supporting business processes related the F&B department that have a potential for BPR implications. The researcher modeled the processes two times. The first process modeling was during the process discovery when the As-Is processes (Dumas et al., 2018; Mayer et al., 1995) and their dimensions were studied. The second phase of process modeling is a revision of the As-Is processes after qualitative process analysis. As a result of process analysis, new solutions have been proposed to eradicate the causes of the As-Is process's problems. Hence, the second process modeling picture the To-Be processes (Dumas et al., 2018; Mayer et al., 1995), a BPR-oriented version of As-Is processes with a BPA (business process automation) mindset.

The researcher deployed the principles and symbols of the BPMN language (Business Process Modeling and Notation) for process modeling, a language maintained by Object Management Group (2011). It is a diagramming language that various businesses have increasingly utilized. Silver (2011, p. v) explains that it is a superior language because of its capabilities and, more importantly, since it is a "multi-vendor standard." The BPMN specifications published by OMG (2011) were the primary source for process modeling in this research paper. Moreover, styles and tips in Dumas et al. (2018) and Silver (2011) assisted the researcher. Finally, all models are illustrated using the *Visual Paradigm software* created by *Visual Paradigm International Ltd*.

4 Results

To begin with, a top-level, abstract diagram (see Figure 13) represents results. This diagram pictures the overall breakfast restaurant service process of the WFS hotel as it is. All subprocesses of this top-level diagram except two of them, namely the last two ones ("Initiate the preliminary cleaning procedure" and "Prepare the restaurant for the next day"), will be addressed in more detail. However, due to the BPR-based scope of this research paper, the fundamental focus is on the core service process ("Serve the guests" subprocess of the top-level diagram).

Every day at five-thirty, one or two F&B employees initiate the breakfast service process. After a thorough preparation process and a briefing meeting (pictured at the end of the preparation process), the restaurant opens its doors to the guests. The hosts welcome the guests and seat them while the core service process runs parallel to this greeting process. At ten-thirty, when both the greeting and the core service process are finished, a preliminary cleaning procedure start in which, more importantly, the buffet will be completely dismantled. After an Entr'acte (between eleven and eleven-thirty), a complete post-service process prepares the restaurant for the next day. The illustrated message flows picture the possibilities of communication between guests and the WFS hotel's F&B department. The instances of these communications in more detail are addressed in the model of the core business process.

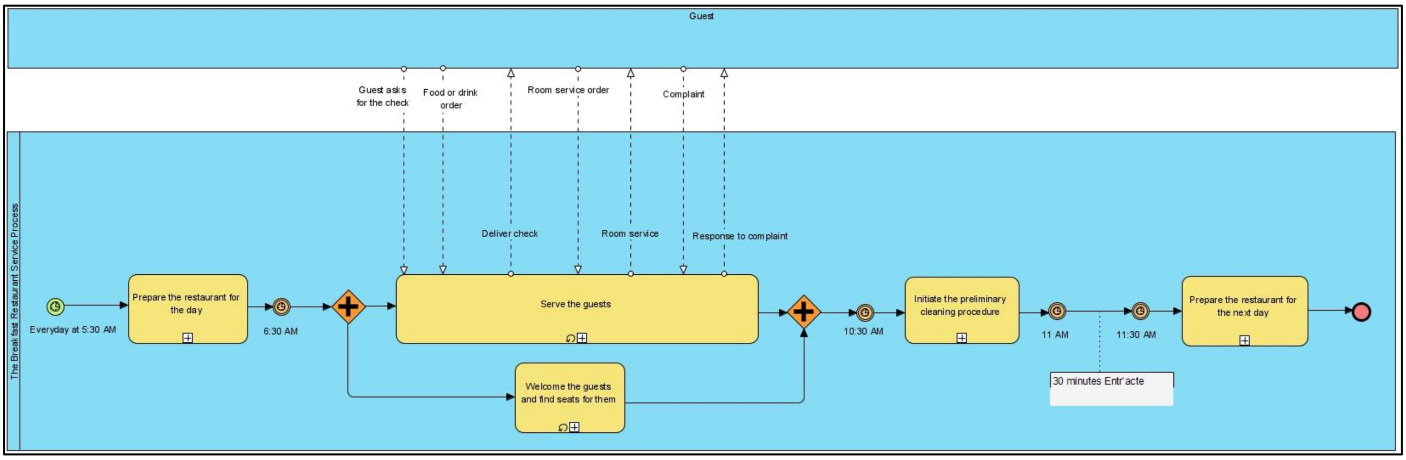


Figure 13:The top-level As-Is business process model of the breakfast service

The Top-Level Diagram of "The Breakfast Restaurant Service Process" of The WFS Hotel

4.1 The Preparation Process

The preparation process (Figure 14) is triggered every day at five-thirty. Usually, it is assigned to one or two junior F&B employees with an appropriate level of experience in this company. Initially, he or she acquires the doors' keys from the night auditor. Besides, he or she receives all daily lists and forms, including the list of quests for the breakfast restaurant and filled room service forms (guests fill these forms the night before). When he acquired all the items, he would sign the registration book and confirm the acquisitions. Then he activates all systems and machines required for the daily operation in the breakfast restaurant, such as coffee machines.

Subsequently, he makes sure that there are no defects and the environment is according to the routines and standards. If he spots a critical problem, he immediately contacts a technician or the manager or both of them. In parallel to these checkups, he also checks the kitchen-related inventories that the kitchen department provides for the F&B department, specifically for the F&B-related daily tasks associated with the buffet service and the core service process. Usually, there are no insufficiencies, but there are circumstances where the inventory level is low, which may interfere with the preparation process's smoothness; however, it does not interrupt the following tasks. Consequently, if the inventory level is low, it prevents the F&B employee from appropriately performing the following tasks. Such a problem causes the F&B employee to inform the kitchen staff to act accordingly.

Then the F&B employee continues to organize the sections of the buffet assigned for the F&B department to be managed. For instance, the juices that needed to be provided from the F&B refrigerator. Another example is the preparation of fresh milk for the coffee machines. After the buffet setup, he distributes the milk jugs for all tables. If there is insufficient milk (due to the low kitchen-related inventory mentioned above), the F&B employee may distribute milk jugs only on a limited number of tables. Then during the next hour, when the inventory was set to an average level and before the peak hours, he would distribute milk jugs for the remaining tables. Finally, before joining all other F&B employees in the morning briefing session at six-twenty, he checks if the newspaper boy has already handled the newspapers.

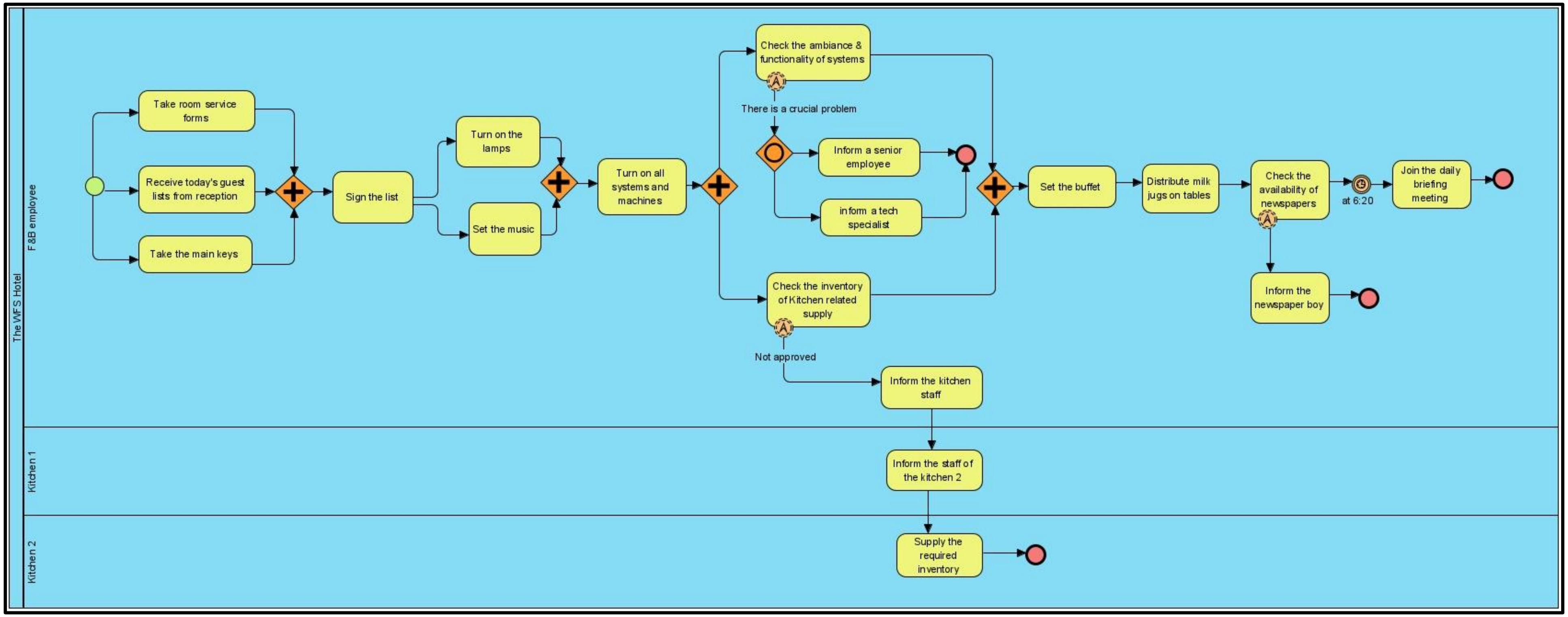


Figure 14: The “Preparation” process model

4.2 The Greeting Process

At six-thirty, the breakfast restaurant opens its doors to guests. A host or hostess greets guests (Figure 15) and asks guests for their room number. The host then needs to check if the guests' names are included in the breakfast list. In most cases, the guests' names are on the breakfast list as guests have acquired breakfast-included room offers. Therefore the host marks their names in the list. However, if they are not on the list, the host immediately books a receipt. Since the receipt is designed for a complete buffet service, it has a specific price attached. Later within the core service process, the waiter demands the receipt and delivers it to the walk-in guest.

Subsequently, if there are several empty tables in the restaurant, guests find a desirable table by themselves. However, if there are no empty tables or the available tables are not what the guest desires, the host starts to find a table. In this scenario, the host notifies the guests that it may take a couple of minutes and ask them to wait for his call in the lobby (from a BPMN perspective, this scenario has been pictured by a non-interrupting escalation boundary event attaching to the "Find a table" subprocess). The host continues with this subprocess (a loop subprocess) until he finds a table. During peak hours, when the host is completely busy with several guests' arrivals, the bus persons and junior waiters responsible for clearing and cleaning the tables may inform him about the availability of a table (pictured by a catching signal boundary event; the event subprocess throwing this signal will be explored under the section specified for the core service process). Finally, when the table was found/chosen, the host either accompanies guests to their seats by himself or asks a senior/junior employee to do so. This control point exists to appropriately shape the host's response when the restaurant is almost fully occupied and when dealing with a waiting queue is unavoidable.

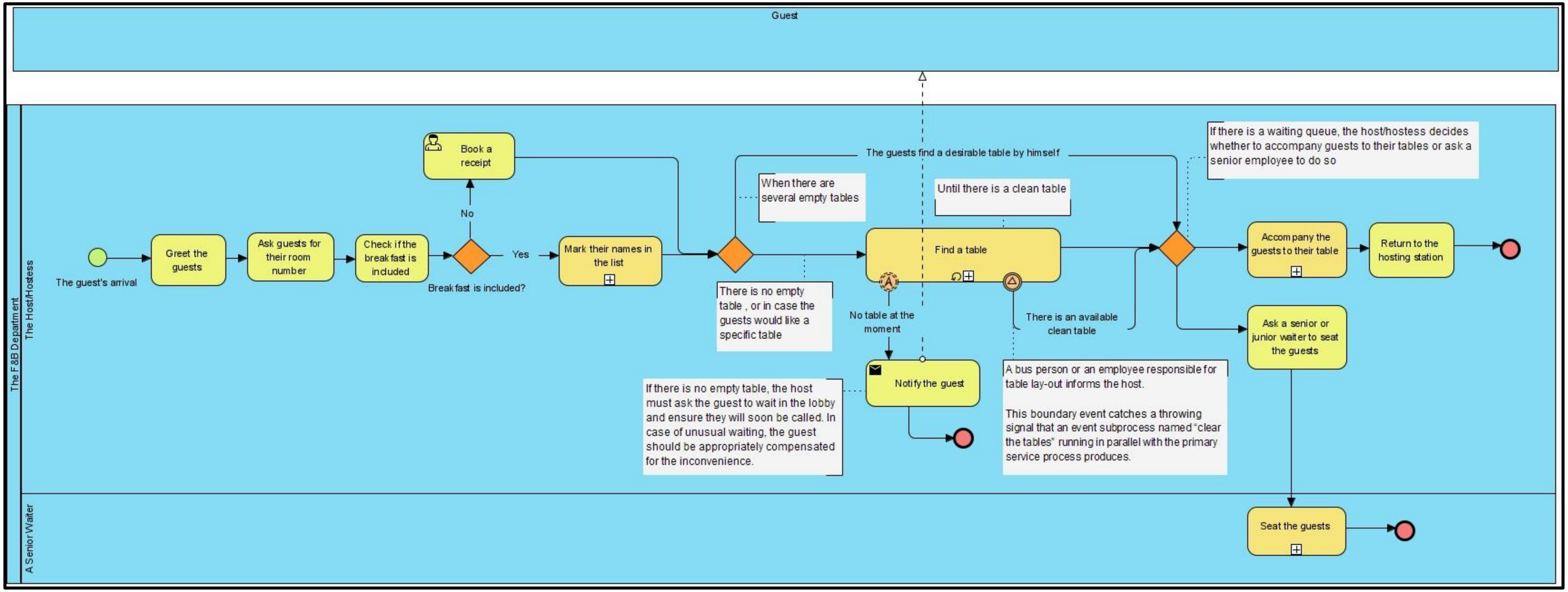


Figure 15: The "Greeting" process model

4.3 The Core Service Process at the Breakfast Restaurant

This section investigates the core process of the breakfast restaurant service (owned by Hosts/hostesses and senior employees) from different angles. The model illustrates almost all scenarios that the process produces or involves, based on the researcher's observation in six months. The problems associated with the unnecessary instance-producing behavior of the process will be explored in the discussion section.

The core process (Figure 16) requires the waiters/waitresses to be responsive to all types of guests' demands during the opening hours. There are three branches of possibilities for the flow of tasks besides event subprocesses running parallel to this process (some owned by the waiters/waitresses). The first branch is associated with taking orders from guests. The following primary branch is the result of the first branch and addresses the food-delivery-related possibilities. Lastly, the third line of activities is concerned with the payments. The payment instances were few since most guests were on the breakfast list of the WFS hotel, and there were few arrivals of the walk-in guests. Consequently, the possibility of observing process tokens ("the current point of execution within a process. A business process can have multiple tokens that indicate that the process is running in multiple paths" (Oracle, 2011, Section 2.1.2.2).) is considerably lower for the payment procedure in comparison to the other streams of tasks.

As soon as guests arrive at the restaurant, the employees stay alert to respond to the guests' signals. In the case of a request, they take the order (see Figure 17, "take the order" subprocess) and make sure it is complete. Before communicating the orders to the kitchen staff, they should check if other guests sitting in the vicinity would like to order (illustrated within the "take the order" subprocess; Figure 17). If there were no other signals from guests in that vicinity, the employee would take the orders to the kitchen; when the kitchen staff confirms the orders, the waiter returns to the salon. It is imperative to highlight that when a waiter/waitress takes an order, they are responsible for the rest of the cycle. Namely, they should return to the kitchen at the right time and deliver the items. If the orders belong to the walk-in guests, the employees who started serving these guests must cover the payment-related tasks or instead inform a senior employee beforehand, for that matter. Moreover, it should be highlighted that the last orders would be taken no more than ten-twenty. Therefore, the waiter should inform the guests about the last possibility of having orders and remind them that the buffet will be dismantled in ten minutes (illustrated as a timer boundary event attached to the relative activity).

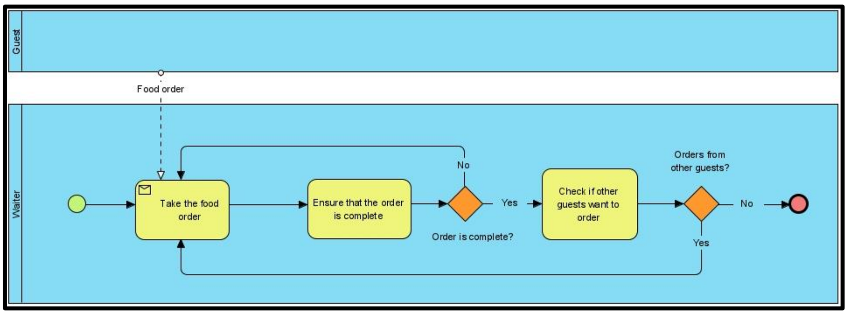


Figure 16: "Take the order" subprocess of the core service process

The second primary line of activities covers the delivery of completed orders and the related scenarios. As soon as ten minutes elapsed, the waiter should return to the kitchen to take the prepared items. Usually, waiters/waitresses manage to return to the kitchen in time (almost two-three minutes earlier) and deliver completed items to the guests at an optimum time range (no more than twelve minutes). Nevertheless, this is not the only scenario since the different periods of the day cause other situations. Because of such situations, the researcher observed more than one circumstance for the delivery process. Thus, an event gateway addresses these circumstances in the process model as four possible lines for process tokens.

When the F&B employee receives the completed orders, either on time or with slight delays (during peak times), he/she will deliver them (if they match the guests' desires according to the previous step). Lastly, after delivering the complete orders, the employee returns to the default position (the initial control gate in the model) to either take new orders from the guests or check if walk-in guests would like to have their checks. At the same time, they should also stay alert if any of the event subprocesses were triggered. Some of them run parallel to the core service process the entire time; for instance, besides taking orders, senior employees are also responsible for supervising junior employees who organize the buffet.

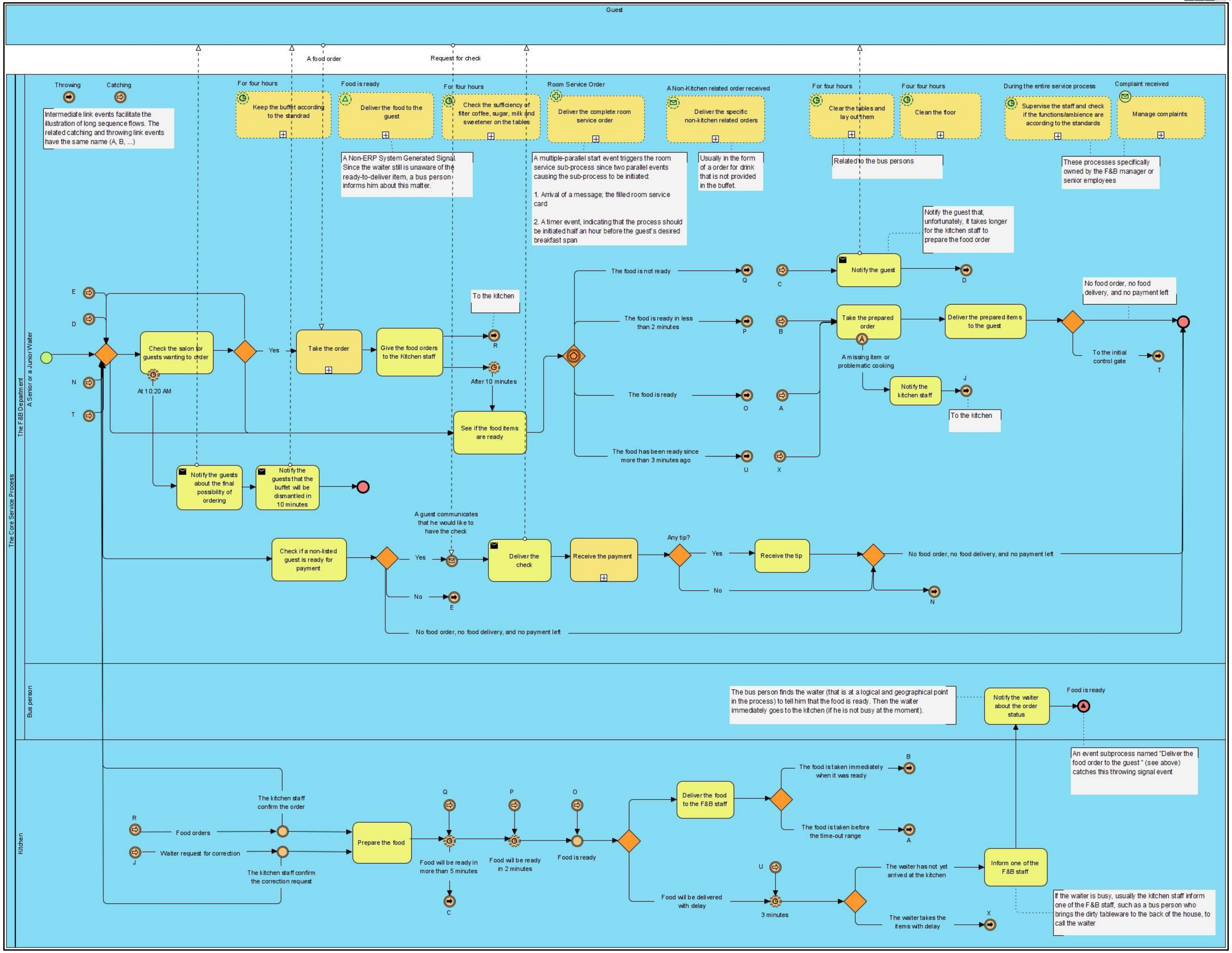


Figure 17: The core service process model

The third and conceptually last part of the service process (regarding walk-in guests) is related to the payment process. The junior or senior employees check the salon to see if guests signal their intention for having the check. If there was a positive signal, then the waiter delivers the check and receives the payment. The payment is received in the form of either cash, debit card, or credit card payments. These three scenarios have been pictured in the payment sub-process (see Figure 18). Finally, if the guest wants to tip the waiter, he or she receives the amount and proceeds to return to the initial evaluation position (initial control gate in the process model).

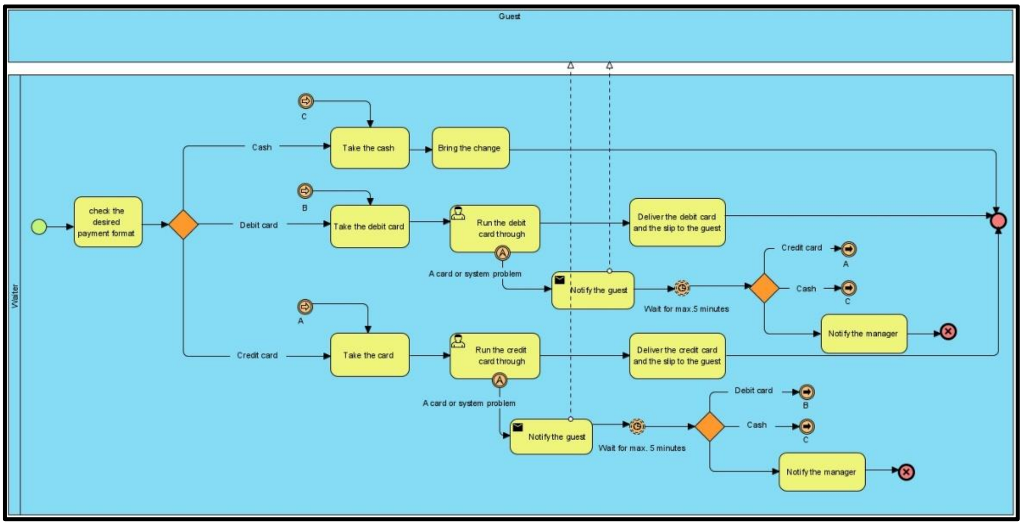


Figure 18: "Receive the payment" subprocess of the core service process

4.3.1 The Processes Parallel to the Core Service Process

Several processes as event subprocesses run parallel to this core process so that the service process remains effective and efficient; the upper section of the core service model (Figure 16) addresses them in the form of event subprocesses. These event subprocesses have supporting roles (owned by bus persons) or supervision-related roles (owned by senior employees, hosts/hostesses, and the F&B manager). Thus, it is imperative to understand that the core business process is not a standalone process and involves various processes, including managerial, supporting, and network processes (Earl & Khan, 1994). Nevertheless, due to the limited scope of this research paper, its BPR orientation, and the scope of the observation, not all of them (for example, the managerial process) are studied. Hence, the researcher modeled two of these event subprocesses, namely the “Room Service” (owned by waiters/waitresses) and “Clear the tables” (owned by bus persons and junior employees) since, from a BPR standpoint of view, their dynamics are of utmost importance for the top-level breakfast restaurant service process.

4.3.1.1 Table Layout Process; A Greeting-Related Process

The entire time that the restaurant is open for the guests, the bus persons, or sometimes the junior F&B employees, as the owners of this subprocess (Figure 19), constantly clear the tables and take the dirty tableware to the back of the house. However, if guests leave a table during peak hours, they should inform the host/hostess directly or indirectly with the help of a mobile F&B staff member such as a senior waiter/waitress. If the restaurant is highly impacted by peak times or if the hosts are considerably busy, bus persons and the junior employees (responsible for table layout) should ensure that the host notices the availability of a newly cleaned table. By default, they should be constantly alert to either spot guests who leave their tables (considerably important in peak times) or take dirty tableware on occupied tables to the back of the house for washing. The former task requires the bus persons to convey an accurate message about the availability of the tables during peak hours, although they do not always manage to do that accordingly because peak times significantly limit the scope of effective communications. This matter will be discussed in the discussion section.

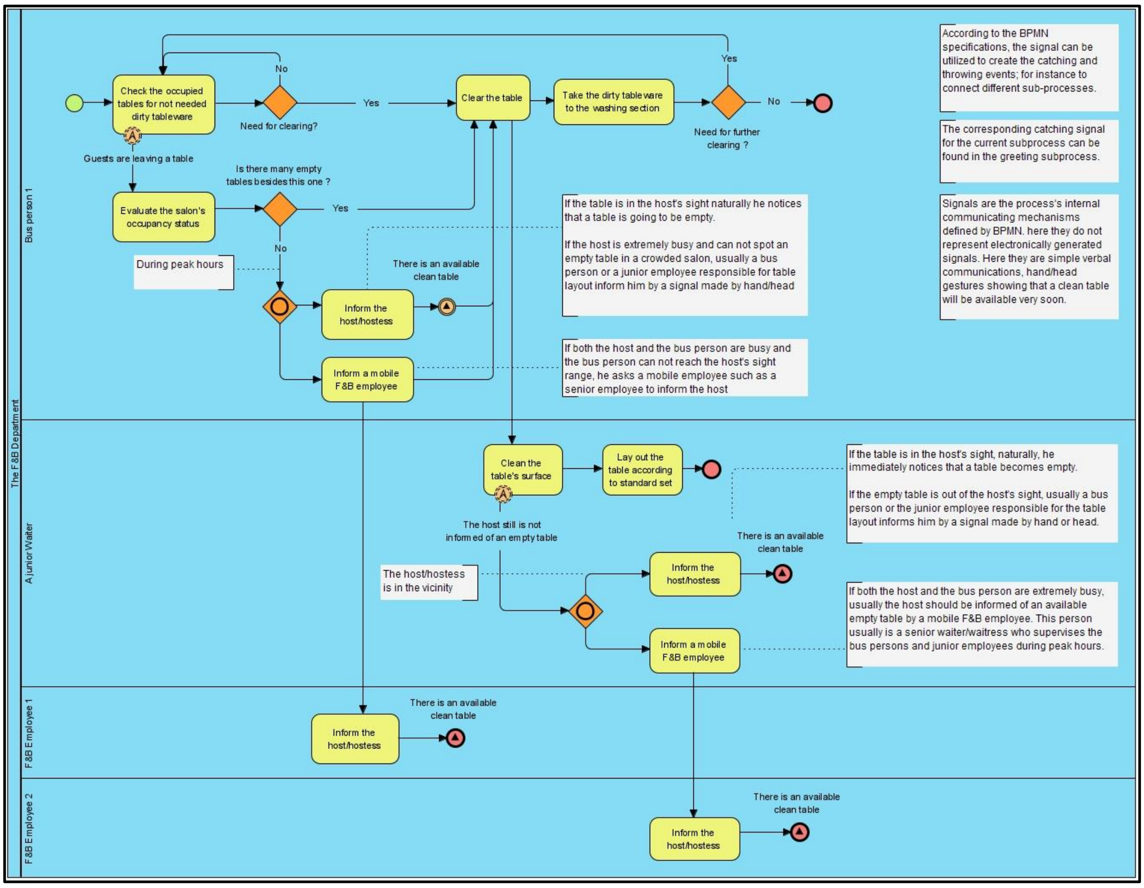


Figure 19: The "Clear the Tables" event subprocess of the core service process

4.3.1.2 The Room Service

From a BPMN perspective, the room service process (Figure 20) is pictured as an event subprocess. It requires the occurrence of two triggers for instantiation, and as a result, has a multiple-parallel start event (pictured in the above section of Figure 16 in the form of an event subprocess with a plus sign). The first trigger refers to the room service request forms (a guest fills a particular form a day before the room service). The F&B employees responsible for each morning's preparation process receive them every morning from the night auditor. The second trigger refers to a timer event which means that the F&B employee responsible for room service should inform the kitchen about the items guests demanded, half an hour before the guest’s desired timespan. In parallel, the F&B employee prepares the room service tray according to the standard. When the items were completed, he would take the complete order and the receipt, deliver them to the guest, and finally ask them to sign that receipt.

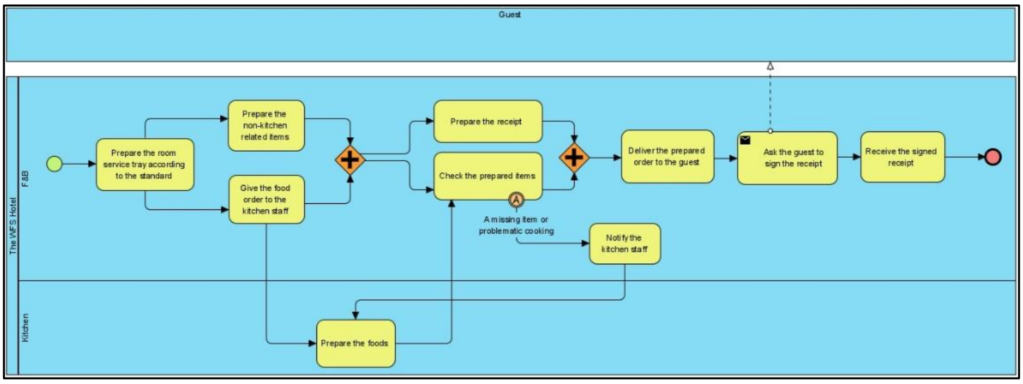


Figure 20: The "Room Service" event subprocess

5 Discussion

5.1 Causal Process analysis

Based on the researcher's observation within six months and after careful analysis of the service process model, the main issue with the breakfast service process was the extension of time required to complete the service cycle for each table within peak times. In other words, compared to the off-peak hours, during peak hours of high occupancy days (an extended period of the day, approximately eight to nine-thirty), the service process time required for each table was considerably higher than the average. Therefore, from a statistical perspective, the service process time (as a quantitative outcome) within peak hours starts to get farther from the mean; Figures 5 and 6 provide insightful illustrations.

Time-related problems were not observable in high frequency. However, during Peak hours of days in which occupancy rates were significantly high (primarily due to the WFS hotel's occupancy rate), the F&B service process and its actors dealt with enormous operational pressure to fulfill guests' demands; consequently, a sequence of problems emerged due to sudden surge in external and internal demands. Thus, the breakfast restaurant of the WFS hotel, when constantly impacted by a significantly high occupancy rate, generated scenarios in which the service process inevitably caused varying degrees of undesired and unplanned outcomes. Causal process analysis attempts to discern the fundamental root causes of those problems using an Ishikawa diagram (Figure 21) that instantiates four categories of causal factors, namely the 4Ps (procedures, people, policies, plant). For clear illustration, the Ishikawa diagram only shows the primary causes. The secondary causes will be scrutinized for two main categories of "Procedures" and "People" in the Why-Why diagrams.

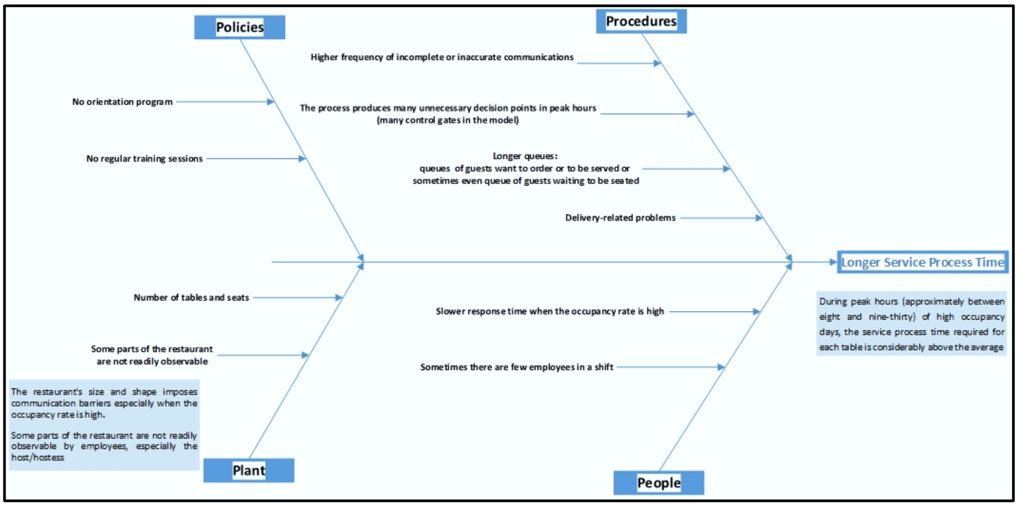


Figure 21: The Ishikawa Diagram

It addresses the main issue (the box on the right side) and the primary causes. The secondary causes are explored within the Why-Why diagrams.

5.1.1 Primary & Secondary Causes

The Why-Why diagrams are pictured in figures 22 and 23.

5.1.1.1 Higher Frequency of Incomplete or Inaccurate Communications

Inaccurate or incomplete communications immensely distort the health of any business process; the breakfast service process of the WFS hotel is not an exception to this reality. In some cases, when the restaurant was fully occupied and there were many orders to be taken, process actors had difficulties communicating smoothly and correctly. These circumstances led the waiters and kitchen staff to rush to perform their tasks, resulting in some chains of problems. For instance, sometimes, the fully occupied restaurant and limited resources (in terms of staff and lack of computer-aided ordering system) caused many misunderstandings between waiters and the kitchen staff or even between guests and the waiters about items demanded. Consequently, such situations required the staff to redo the process's relative line of tasks, which caused further complications and delays for the service process.

Another communicative problem was that sometimes the process actors were unavailable at the right time to respond to each other. The "Greeting" process provides a clear example of that as follows. In combination with a high occupancy rate, the restaurant's size and shape impose a considerable complexity for the hosts/hostesses to locate the available clean tables in the restaurant as they are inevitably busy with newly arrived guests for an extended period of the day. These situations fundamentally require other employees to signal tables' availability, especially those far from hosts' sight. Although the employees, including the bus persons, attempt to provide such information in time, they are not always successful due to physical barriers and high occupancy rates (the salon is considerably crowded). Such adverse effects of communicative problems subsequently lead to longer queues for guests who want to be seated.

Employee fatigue is another reason behind some communication problems. This secondary cause can be analyzed from two perspectives. From the first perspective, inevitable operational pressure causes the employees to have considerable difficulties keeping up with the significant number of guests' arrivals and orders, primarily because (a) the tasks are aggregate and abstract; (b) the process has difficulties handling a considerably high amount of information (for instance taking orders from several tables in a row was not possible); (c) the waiters/waitresses are required to complete the service cycle for a specific table as soon as they would take an order; and (d) the number of staff in the shift is not well-provided. From the other perspective, the level of micromanagement is another concerning issue. Although such supervision is necessary at first sight to prevent communicative problems and facilitate a more smooth operational speed, there is a limit for such an outcome. After a certain period, micromanagement seems to increase employee fatigue and implicitly causes communicative problems.

5.1.1.2 Unnecessary Decision Points

One of the most apparent issues of the core service process under operational pressure is the presence of many decision points (control gates in the model). Since the process has no computer-aided mechanisms to deal with the vast amount of information flow, the waiter/waitress should assess both salon's status and the kitchen's streamwork at any one time to ensure a desired outcome at the right time. Thus, higher operational pressure created many control points that were not compatible with straightforward objectives of the service process and consequently resulted in extended time for executing many of the tasks.

Hence, the unnecessary instance-producing behavior of the process imposes extra pressure on the operation and, during the peak hours, unrealistically requires the employees to stay significantly alert and responsive for an extended period under excessive pressure. Although fewer instances of these control points are observable during the typical service hours, in peak hours, the instance-producing behavior makes the process considerably vulnerable to human mistakes that consequently causes slower operational flow and, finally, to various degrees, lowers customer satisfaction.

5.1.1.3 Longer Queues

When the restaurant operates within off-peak hours, an order is completed by ten minutes, and waiters/waitresses arrive at the kitchen precisely at the right time to take the items and deliver them. On the other hand, during peak hours (when the restaurant operates with maximum occupancy for one to two hours), higher demand for non-exhibited buffet items causes higher operational pressure on the staff and negatively changes the time required for food preparation towards an uncertain range. Furthermore, during peak hours, the kitchen staff need more time to prepare the items, and as a result, the preparation time would be extended, and consequently, guests wait longer to be served.

Additionally, within peak hours, the guests experienced a longer waiting time to get seated. The hosts/hostesses have difficulties locating empty tables due to the restaurant's size and shape. Therefore, they are primarily dependent on the signals from senior employees or even bus persons who communicate the availability of empty tables from the other side of the restaurant. Furthermore, when guests were seated after waiting for a specific time in the queue, they found difficulties finding a non-busy waiter/waitress to order.

5.1.1.4 Delivery Related Problems

In some cases, when the restaurant was fully occupied, the waiters/waitresses had difficulties finding the guests they had taken orders from, and consequently, the complete orders were delivered with delays. The primary reason was that the guests decided to find a waiter near the buffet station and order there. They realized that since the restaurant is crowded and may take them a while to be noticed, it is more convenient to order while serving themselves by the buffet station.

Although in most cases the waiters were able to find the location that the guest mentioned, in some cases, it took the waiters a couple of minutes to find their table and deliver the complete orders. Thus, in a big and fully occupied restaurant, communication barriers trigger delivery-related problems, such as difficulties related to locating the guests' tables. Additionally, the other problem was the lack of a menu and written guidelines. Therefore, despite being greeted and guided when they arrived at the restaurant, they did not know which one of the F&B employees is responsible for taking orders and how long they should wait for them.

5.1.1.5 Availability of Few Employees in a Shift (in some cases)

The number of staff required for a shift was usually well calculated based on the six-month close observation. Nevertheless, during peak hours of high occupancy days, there were times that the number of staff did not correspond accurately to the level of service required. Such a problem was firstly due to the shift management system’s slow response to notifications of absences, and secondly, it was because of the miscalculation of the system. Ultimately, although the inadequate level of recruitment can be a possible cause, the former reasons have heavier weights.

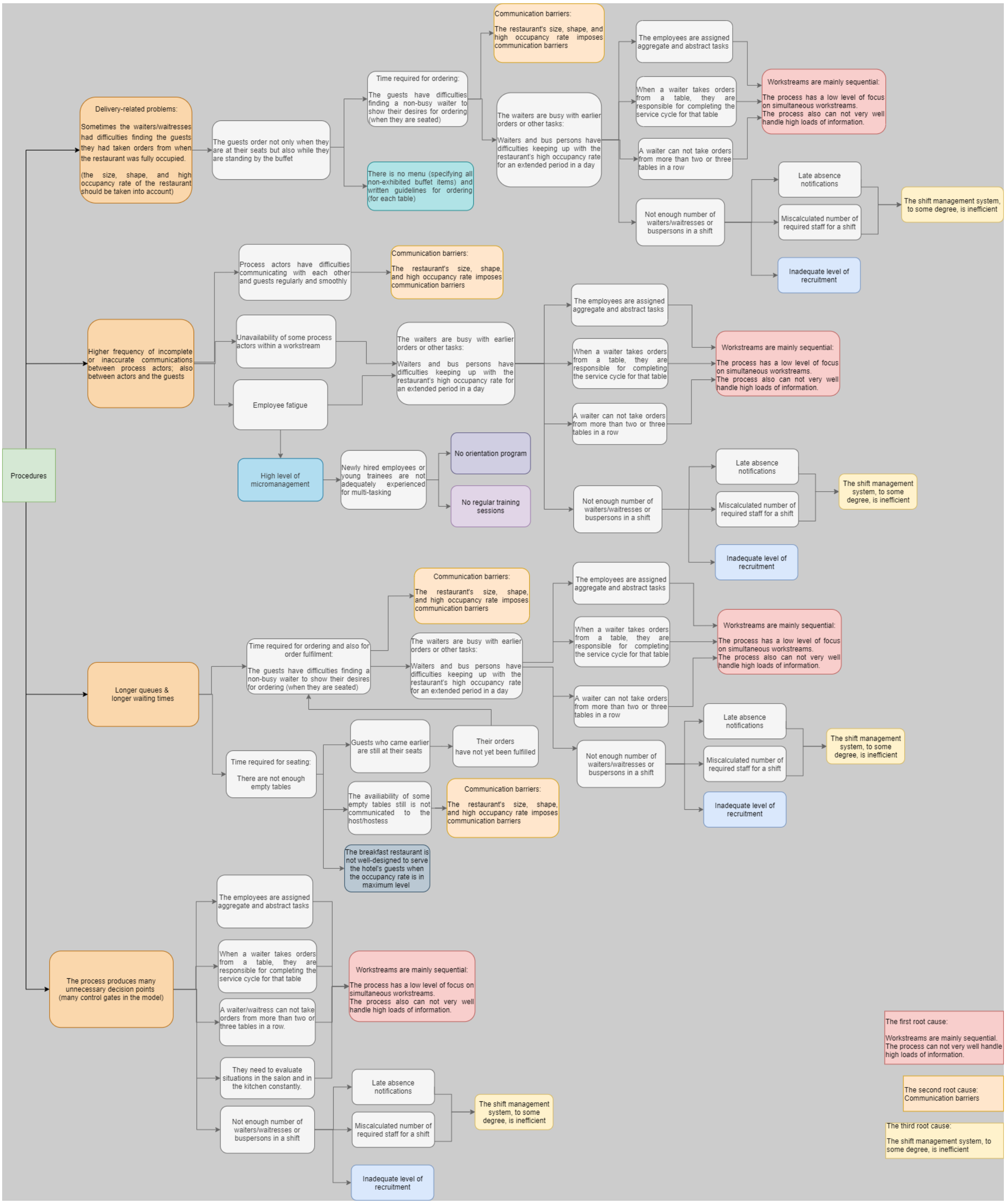


Figure 22: A Why-Why diagram for the "procedures" category of the Ishikawa diagram.

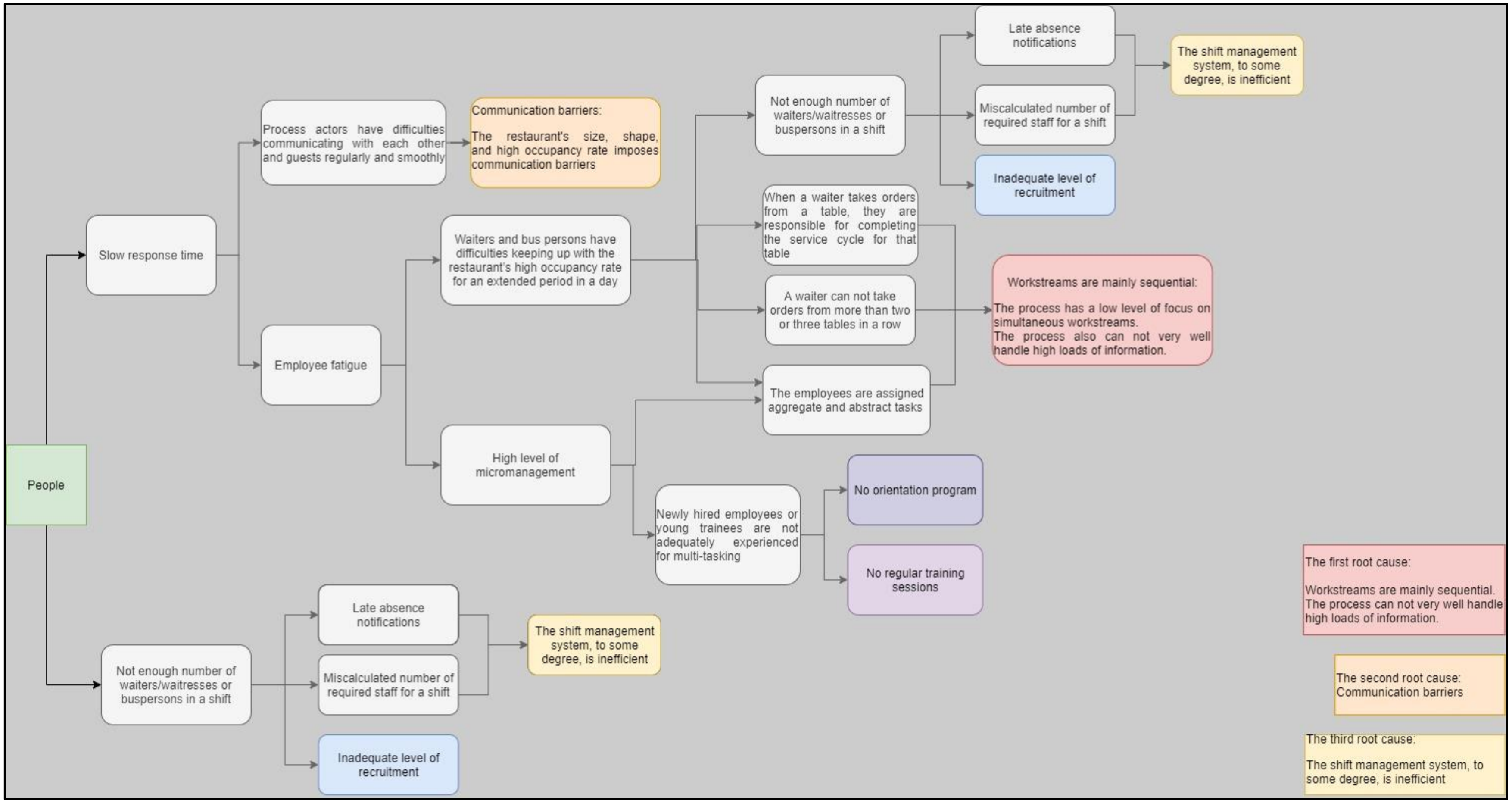


Figure 23: A Why-Why diagram for the "people" category of the Ishikawa diag

5.1.2 Root Causes

Based on the apparent evidence during the six-month observation and after a thorough causal process analysis using the Why-Why diagram, similar patterns of reasoning emerge within the root-cause analysis. These patterns have been highlighted in figures 22 and 23. The following factors are the root causes of observed primary problems for two categories of *procedures* and *people* of the Ishikawa diagram. Compared to the other elements (illustrated in the Why-Why diagram), the following three elements more consistently and severely impact the service during peak hours. Due to the paper's BPR orientation and the scope of the study, two categories of the *Policies* and *Plant* have not been scrutinized. The latter categories are significantly connected with the managerial processes and long-term organizational objectives beyond the current research domain, focusing on the core service process.

5.1.2.1 Workstreams Are Mainly Sequential

The primary root cause of the service process is that workstreams, either intradepartmental or interdepartmental, run extensively sequentially, and there is a low level of focus and plan for simultaneous workstreams. As a result of such a structure, the process has a limited ability to handle several demands (external and internal ones) and a tremendous amount of information on high occupancy days. Based on the evidence obtained during the observation period, a relatively simple mistake in such a work structure triggers a chain of undesirable and inevitable problems. Another sign associated with this structure is that many intradepartmental tasks are aggregate and have insufficient detail, and the boundaries of each task are obscure. Furthermore, another major problem was that the service process cycle for each table was not divided into specific parts to be designated between specific employees.

5.1.2.2 Communication Barriers

The restaurant's size, shape, and maximum occupancy rate create particular communication barriers. In peak times, the employees have difficulties communicating regularly and smoothly with each other and guests in the way they usually do. Regarding the available sequential structure, the defective methods of collecting information in initial workstreams impose unavoidable corrections and delays on later workstreams and the service process in general. From guests' perspectives, during peak hours, since they had had less frequent opportunities to signal their desires to waiters/waitresses, they gradually showed signs of confusion, and in some cases, their desires remained to some degree unfulfilled.

5.1.2.3 Relatively Inefficient Shift Management System

The current shift management methodology is not robust enough to respond to the late notifications of absence that the F&B department receives immediately. However, a shift management system that harnesses the power of computer-aided methodologies can prevent problems such as slow response to absence notifications. In the next section, a process model will be proposed to cope with such late notifications. Moreover, due to the lack of in-time data feeding mechanisms, the current methodology has difficulties calculating the correct number of required employees for a shift. Although the latter problem has not been addressed in this paper, the role of a relative computerized system in resolving such an issue is considerable.

5.2 The To-Be Processes

The proposed To-Be processes in this section of the paper attempt to either eradicate the root causes or significantly reduce the severity of their impacts on the breakfast service process of the F&B department of the WFS hotel. The computer-aided mechanisms can create parallel structures with a significant level of autonomy in which the conveyance of information is to a considerable degree flawless. Suggested computer-aided mechanisms of the following proposed To-Be processes bring significant momentum to the processes, especially the core service process. These benefits follow Davenport and Short's (1990, p. 12) points pinpointed in Table 5. Accordingly, and regarding the discussed root causes of problems, proposed To-Be processes with the assistance of computer-aided systems primarily enable the breakfast service process to:

- manage tasks through a considerable degree simultaneous and automated workstreams (intradepartmental and interdepartmental);

- handle the high level of information using centralized data store and computerized assessments (primarily for the high number of orders and their entire details);
- substantially diminish the communicative problems resulted from sequential work structure, human errors, and geographical barriers (for example, the unnecessary movements between the salon and the kitchen);
- minimize the number of intermediary people in the process;
- track the current status of many tasks; and
- register a significant portion of input data for current processing and future organizational improvement initiatives using data analysis frameworks.

5.2.1 The Core Service Process

The following To-Be process (Figure 24) uses a computer-aided mechanism and enterprise resource planning system (ERP) to connect the service process actors to the guests in a highly simultaneous structure. As a result, the F&B and kitchen departments can perform their streamworks with considerable autonomy, and tasks are not abstract anymore. Therefore tasks are distinguishably designated to senior and junior employees. Moreover, this To-Be process provides a platform in which task statuses are highly clear, and the information flows are considerably less defective as most critical points' information is handled by a computerized system.

Guests specifically trigger two types of order-related requests and one payment-related request using the WFS hotel's portal. The installed ERP system receives these requests, processes them, and notifies the relative process actors to fulfill those requests. Accordingly, when guests need to order, they can order face-to-face or directly send the complete food orders to the kitchen. Regarding the face-to-face orders, guests call a senior waiter/waitresses using call buttons installed on their tables. The senior employee has a receiver (an electronic watch on his/her wrist; many companies such as NTTWORKS' Syscall have produced such technologies) and immediately reacts to the request. The system allows the employee to see the number of the table and accordingly reach out to that specific table. If the occupancy rate is high or at the maximum level, the system distinguishes between requests based on the time they have been sent. After a short period of utilizing such a system and data-feeding and data recording mechanisms, the management can designate the optimum number of senior employees who have such receivers to correspond accurately to the restaurant's occupancy level.

Moreover, when the employees arrive at the tables, they communicate the orders to the kitchen’s data store using an electronic menu and the wireless platform of the ERP system. If guests prefer the self-ordering mechanism, using the installed QR-code tags on their tables and their electronic gadgets such as mobile phones, they will be able to order directly. Such a mechanism is predicted to be highly useful during peak hours to fulfill guests’ demands timely and, as a result, make new empty tables available for newly arrived guests. Hence, by implementing two mechanisms for ordering, the F&B department reduces the waiting queues associated with the greeting and ordering processes. Lastly, if guests want to receive their check when their meals are completed (walk-in guests), using another button installed on the table, they distinctively call a senior employee for the payment procedure. Figure 24 illustrates all steps within this proposed mechanism. Regarding the room service, similar to the core service process, a computer-aided mechanism can facilitate the service and information flow (for instance, using QR-code ordering).

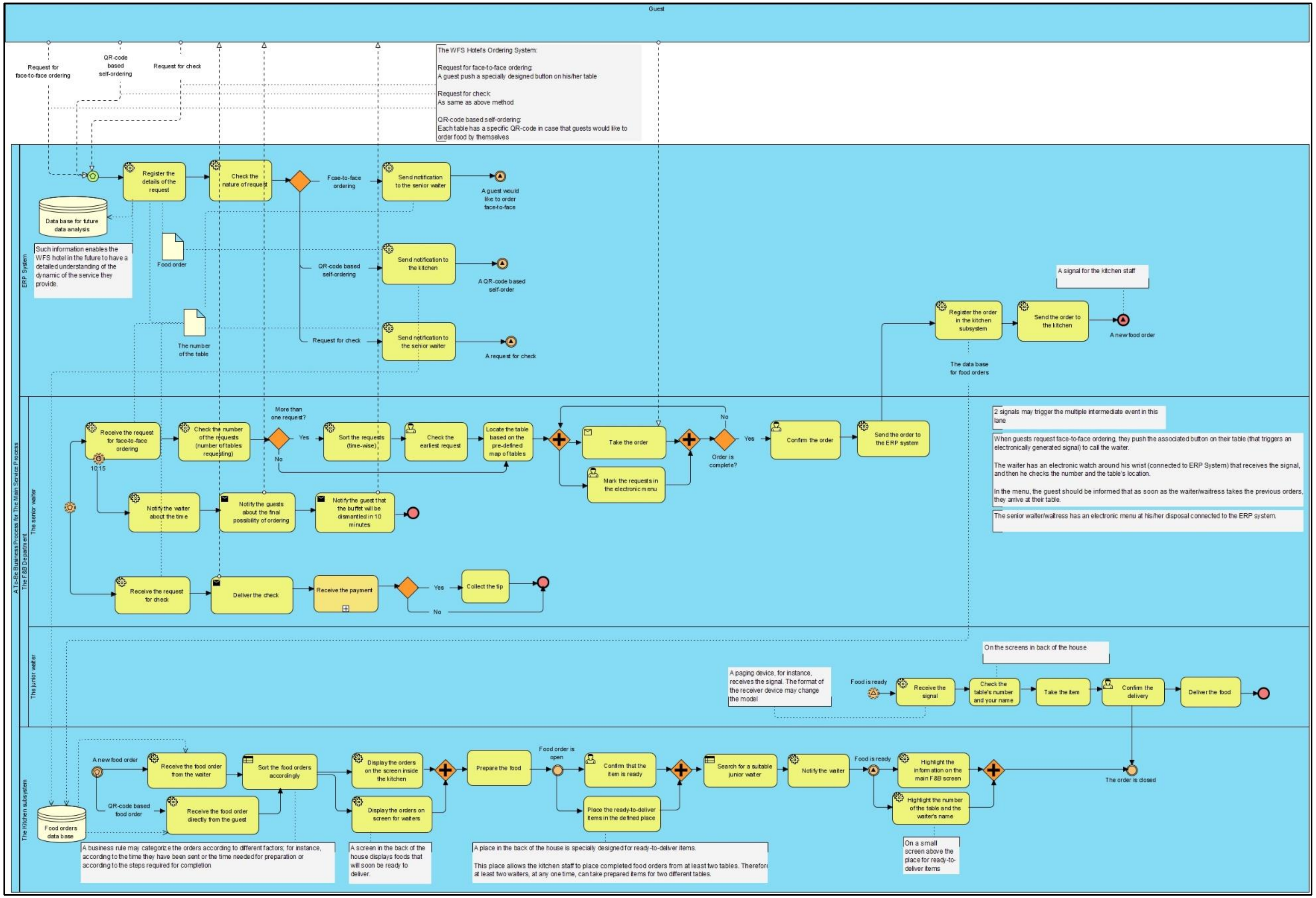


Figure 24: A To-Be process for the core service process of the WFS hotel (event subprocesses of the corresponding As-Is process are not pictured here)

5.2.2 The Greeting Process

The Primary Problem with the greeting process was that during peak hours, the hosts/hostesses and, more importantly, the service process as a whole could not prevent the formation of a waiting queue (not in all circumstances but many of them). Based on the causal analysis (Figures 22, 23), communication barriers and the highly sequential structure of the service process cause these queues. From the latter's perspective, since the employees can not keep up with the rate of the incoming guests and new orders, the service process increasingly becomes sluggish during peak hours. Therefore, many demands of already seated guests remain unfulfilled. The previous To-Be process (Figure 24) addressed this fundamental root cause.

From another perspective, these are the communicative problems that largely contribute to the emergence of queues of guests waiting to sit. In other words, during peak hours, the maximum occupancy rate of the restaurant, in combination with its two other factors, size, and shape, creates a situation in which employees can not regularly and smoothly communicate the availability of specific tables to the hosts/hostesses. Thus, the following To-Be processes (Figure 25 and 26) utilize a mechanism to tackle this communicative problem.

The junior employees and bus persons assigned with clearing and cleaning tasks immediately after realizing that guests leave a table signal the number of that specific table using a device similar to a pager. Then the receiver device available at the host's station catches that signal and shows the numbers of all tables available at the moment. Such a mechanism prevents a significant portion of unnecessary efforts, considerably minimizes the queue, and increases the accuracy of the information transmitted without the need for intermediary employees or temporary movements across the restaurant for assessing the salon's status.

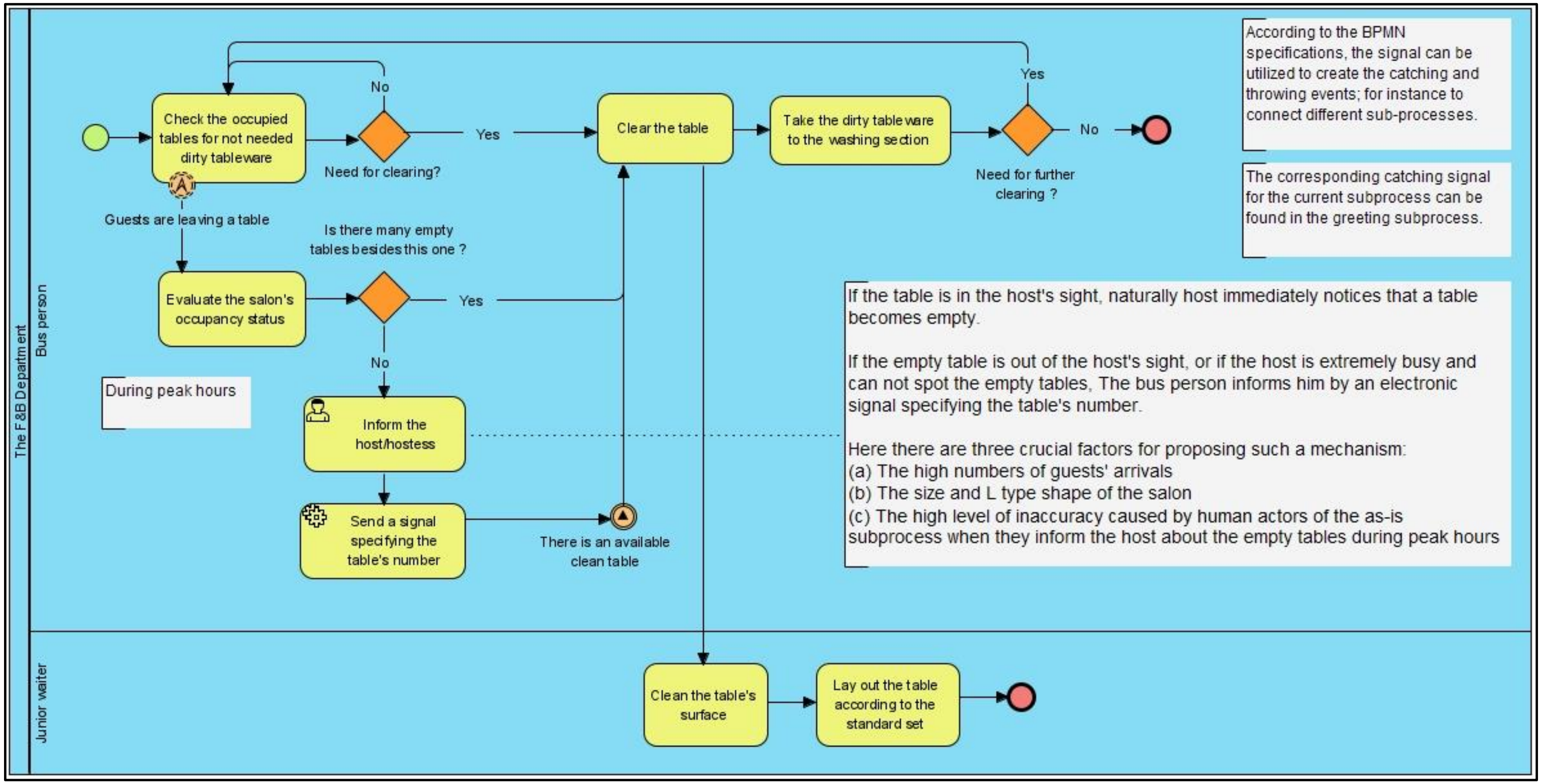


Figure 25: A To-be process for the “Clear the tables” event subprocess of the core service process

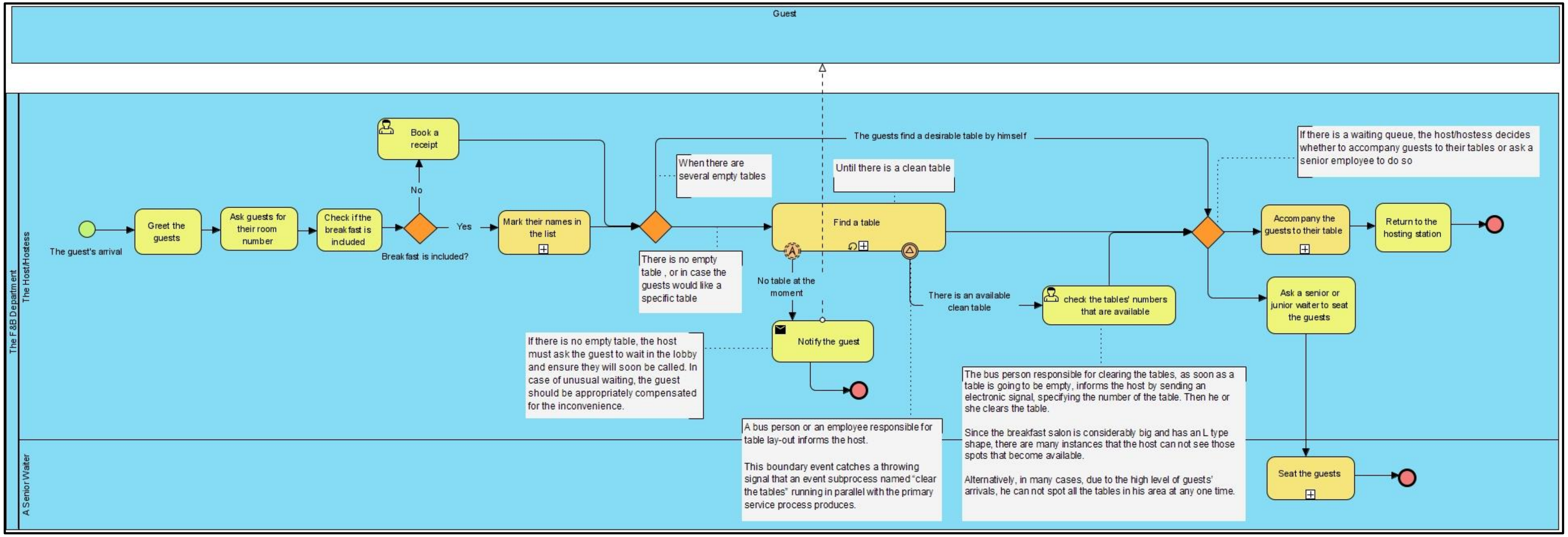
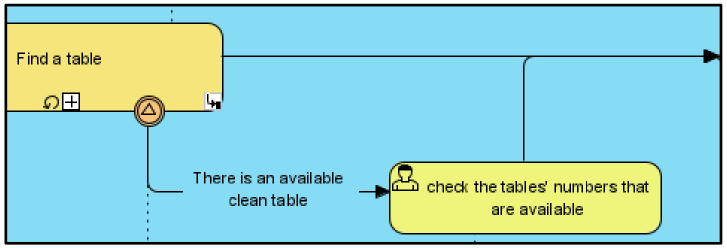


Figure 26: A To-Be process for the Hosting/Greeting process



5.2.3 The Preparation Process

In some circumstances, due to interdepartmental miscoordinations, the F&B employees responsible for the preparation process (Figure 14) had difficulties having access to the right amount of kitchen-related inventories at the right time. Such a problem existed since, in some cases, the right amount of inventory was not provided, or in some rare situations, the kitchen staff did not check the level of inventory that the F&B department required and should have been prepared before five o'clock. Thus, reactive inventory checkup procedures and the lack of a computer-aided platform were the reasons behind unnecessary interdepartmental communications and delays in the preparation process. In the following To-Be (Figure 27) process, these unnecessary communications between the F&B staff and the kitchen staff have been eliminated due to introducing a simple subprocess to the top-level diagram of the breakfast service process (Figure 28).

Every day at the end of post-service processes, a responsible F&B employee quantifies the current inventory level and updates the associated section in the computer-aided system. Then the ERP system immediately calculates the right amount of required inventory for the next day. Subsequently, the responsible kitchen employee must check the highlighted items and prepare them at the right time. Therefore, the ERP system can provide the optimum level of synchronization to resolve most miscoordination problems, such as inventory problems. Figure 29 picture the details of this subprocess.

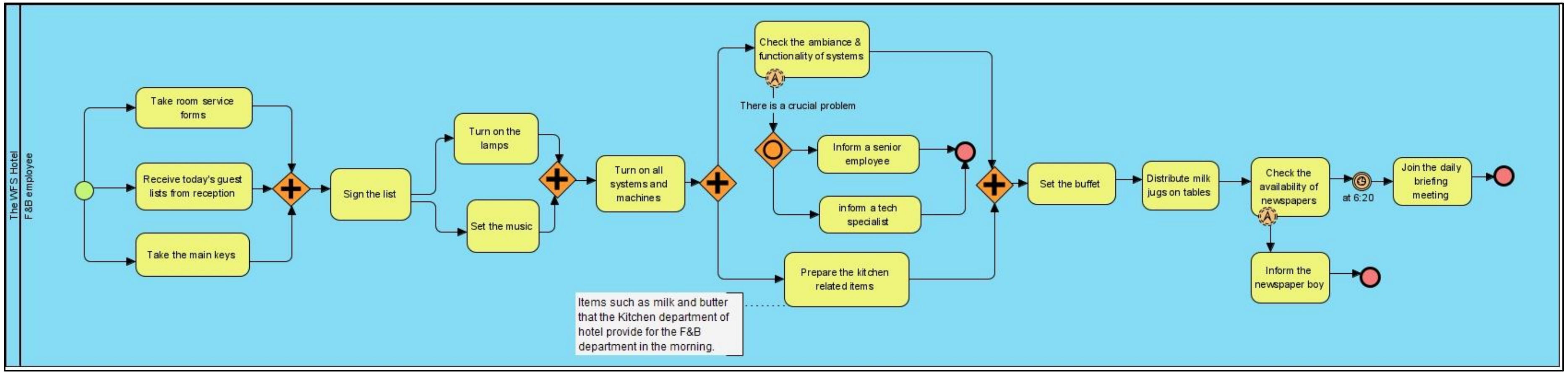


Figure 27: A revision to the Preparation process; for comparison, see Figure1

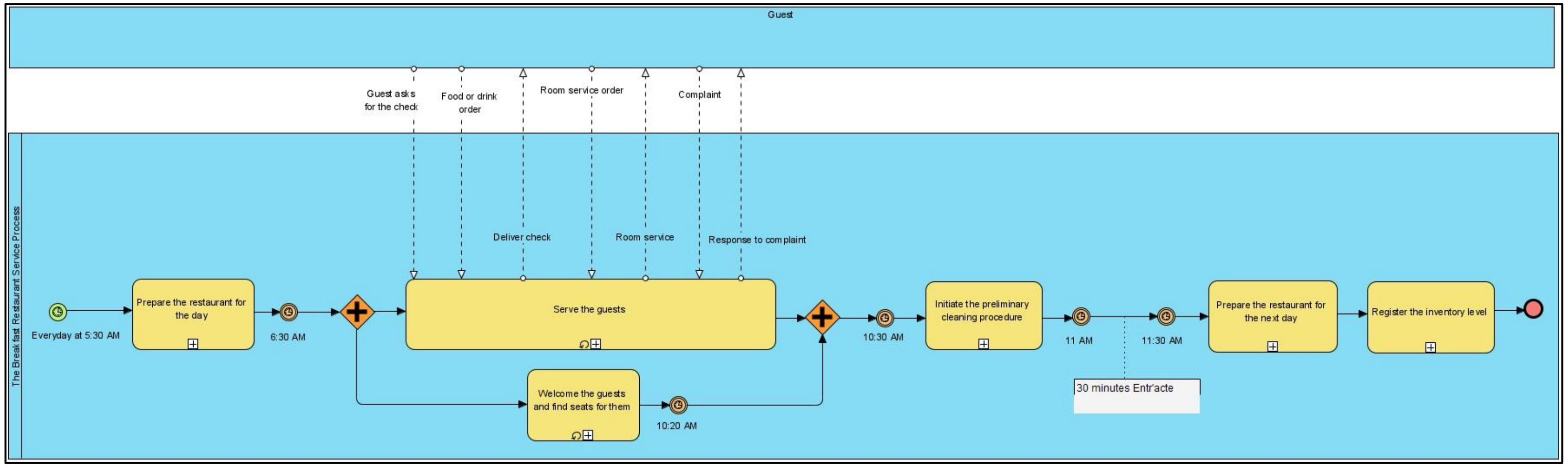


Figure 28: A To-Be process for the top-level diagram of the breakfast service

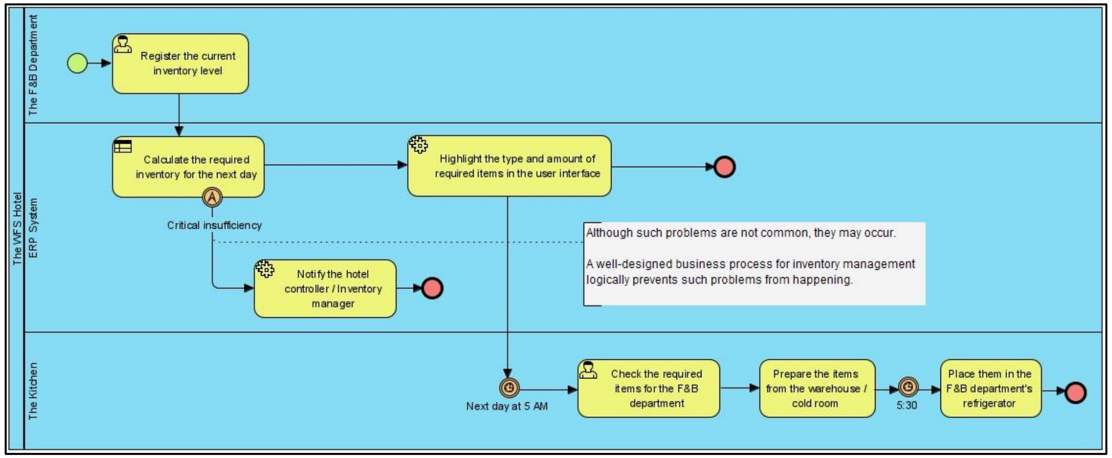


Figure 29: A new subprocess for top-level diagram: "Register the current inventory level"

5.2.4 The Shift Management System

Usually, enough employees were available in each shift. Nevertheless, in some instances, especially during high occupancy days, the considerable operational pressure pointed out that the shift schedule was not efficiently managed. Based on the evidence during the six-month observation, the primary reason behind that was the inability of the shift manager to respond timely to notification of absence.

The subsequent To-Be process (Figure 30) attempts to cope with late notification of absence and provides employers a platform to find suitable employees at short notice for unexpected peak times. According to Stiehl (2014), shift management for restaurants and hotels plays a crucial role. He argues that employers in such organizations should form and administer two employee pools for optimum shift management, ensuring a stable and high-quality outcome for their processes. Accordingly, the employees in the first pool are assigned fixed working schedules, and the second pool of employees agreed upon a flexible schedule. If there is a shortage of employees, an automated ERP system notifies the members of the second pool. However, if an employee of this pool could not attend at short notice for any reason, they send an absence notification to the system via a portal. Then the ERP system either automatically finds another candidate for replacement or directly notifies the shift manager.

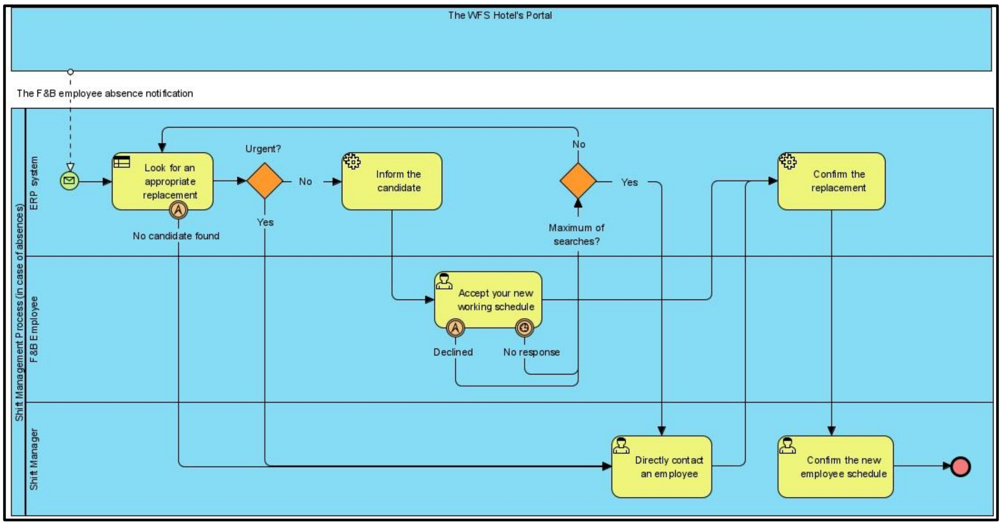


Figure 30: Shift management (in case of absences)

This model replicates Stiehl's (2014, p. 38) model except for slight differences in the labels and designs. Stiehl (2014, p. 38) created this model after revising Dimitrova and Hill (2008, p. 5) model.

6 Limitation

6.1 Simulation

The management team in a service organization has a significantly limited ability to design an experiment to study the relationships between all factors in a system view of the organization. Regarding the service sectors, due to the inherent features of the service sector (see Section 2.2.1.2), such as separability (Ghobadian et al., 1994), a service organization can not design laboratory experiments or pilot studies in a way that manufacturing sectors do in the context of frameworks such as RDM, the six sigma methodology or BPR practices. Accordingly, Antony et al. (2007) argue that in contrast to manufacturing circumstances, the customers are significantly involved within the provision processes; thus, they dictate their desires constantly and dynamically in their interactions with service organizations.

Hence, minimizing the enormous costs (in terms of customer satisfaction and financial-wise) of trials and errors requires the service organizations to consider other methodologies to address the processes' precise inputs and outputs. Within the context of environments with a high level of complexity and uncertainty, robust methodologies such as simulation project the best settings for operation (Hasenkamp et al., 2009; Law, 2014) and enable service organizations to picture customers' multi-layered interactions with processes. Since the scope of this paper was limited, the researcher did not apply this mechanism for more sophisticated process analysis.

6.2 Cost-Benefit Analysis

The successful adoption of BPA in small and medium-scale organizations requires significant attention to pilot studies and accurate exploration of BPA projects' limits (Mohapatra, 2013). Accordingly, quantifiable measures are necessary for both pilot studies and BPA projects to accurately anticipate crucial factors such as costs and monetary benefits at the end (Mohapatra, 2013); any fundamental organizational change requires a reliable and logical analysis of mid-term and long-term benefits for organizations. Nonetheless, despite the significant role of such an analysis, this paper lacks a thorough quantitative cost-benefit analysis; such an analysis could clarify if the required investment for the proposed BPR-oriented business processes brings a desirable and precise range of outcomes.

7 Conclusion

This study aimed to identify procedural flaws in a specific business process in the hospitality industry context, and then the researcher explored the possibility of eradicating those defects' root causes by proposing a new process design. Therefore, under a qualitative research design and observational methodology, the researcher studied the breakfast service process of a five-star hotel in Vienna (in this paper referred to as WFS hotel) to ascertain the causes of problems that prevent this service from achieving a high-level quality. Empirical evidence obtained in the six-month observation period indicated that the fundamental issue with this service process was the considerable extension of time required for serving each table during peak times. Thus, a root cause analysis was conducted to address why the service process requires a transformation facilitated by the BPR discipline.

Results of the process analysis illustrated some similar and persistent patterns within the overall construct of the service process, causing the existing problems. Correspondingly, process analysis's patterns pointed out three initiating causes of the main issue, that is, the extended required time to complete a service cycle for a table in peak times: (a) highly sequential workstreams, (b) communication barriers, and (c) relatively inefficient shift management procedure. The first root cause recognizes the existing work structure and the associated problems. It indicates that the disproportionately sequential structure of workflows imposes a higher possibility of human errors and work-induced stress on the service process (specifically during peak times); due to such a structure, a relatively small human error can negatively impact other designated tasks in one or more than one workstream.

Furthermore, due to the prevailing lack of simultaneous workflows, the process has a minimal ability to deal with the increasingly higher input information. Correspondingly, this situation caused further delays, employee fatigue, and severe micromanagement during many peak times. The second root cause points out the frequent communicative problems on high occupancy days. When the restaurant's occupancy reached its maximum level and lasted for more than one hour, the service process showed considerably more flawed communications. Two other underlying factors, namely the restaurant's size and shape, accelerated such communicative problems by impacting the regularity and smoothness of communications. Lastly, the third root cause indicates the relative inefficiency of the shift management mechanism in some cases. The shift manager could not react timely to notification of absence. Thus, sometimes, the number of employees in a shift did not correspond accurately to the restaurant’s occupancy level, which induced extra operational pressure.

Therefore, the suggested To-Be processes aimed to bring logically sound structures and computer-aided mechanisms into the process to eliminate the root causes of problems. For that reason, the To-Be processes incorporated an ERP system and some associated sub-systems to enable the service process to handle tasks in a highly simultaneous manner. Furthermore, it is expected that these To-Be processes result in an overall diminution in communicative problems and help the service process to handle a massive amount of information relatively quickly. Finally, based on the current literature, a To-Be process was suggested to cope with the late notification of absence to prevent the service process from having a disproportionate number of employees in peak times.

The successful implementation of the BPR practices requires organizations to define their objectives and stakeholders precisely. If they fail to create such a strategic map, their competency would be severely impacted, and in that case, deploying BPR-oriented systems would not be a coherent strategy. Moreover, the nature and quality of the relationship between management and employees are of utmost importance. Therefore, organizations considering BPR, parallel to top-down managerial channels, should apply horizontal mechanisms in which employees are determined to grow, and correspondingly, they are trusted to perform their tasks with a relatively logical level of autonomy. Lastly, companies must adequately invest in the IT infrastructures, accurately design the structures, and carefully select systems for their operations as the costs of mistakes may considerably surpass the benefits they initially associated with the BPR project.

Furthermore, this study was conducted because it recognized that considerably little attention had been given to transformational quality improvement practices in the hospitality industry. Nevertheless, this research is specifically designed for this business process, and the results are not applicable for similar service processes. Accordingly, future comprehensive academic papers can address guidelines by which hospitality organizations can find suitable BPR-oriented practices for their operations.

Ultimately, the significance of this paper lies in the fact that thorough causal analysis and logically oriented process models can robustly convey why and how increasingly available computer-aided systems have the enormous power to transform hospitality processes. Nonetheless, the researcher acknowledges the lack of sophisticated data-driven methods such as simulation and well-crafted cost-benefit analyses to support the results; the positive results of such analyses can convince the management to invest in BPR-oriented systems. Therefore, more sophisticated and data-driven analyses communicate if BPR mechanisms achieve what they promise.

On the whole, BPR disciplines have the enormous power to turn around organizational operations that entirely or partly are sluggish. Nevertheless, in service organizations such as hotels, the business processes and corresponding BPR mechanisms address a fraction of the puzzle of service quality. Moreover, the multidimensionality of service quality and the subjective nature of customers (internal and external) impose various barriers on organizations deploying BPR, and, therefore, organizations must adopt a clear strategic map and remain realistic about the outcomes.

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