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Master's in Strategy, Innovation and Sustainability

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FULL – SERVICE RESTAURANT MANAGEMENT INFORMATION SYSTEM SELECTION MODEL

Master Thesis (2017)

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Abstract

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The purpose of this study is to develop a model for selecting an information system for a full-service restaurant management. This study is based on a comparative analysis of 40 information systems and 5 interviews with owners and managers in the restaurant industry in Saint Petersburg, who have experience in implementing and using of such information systems. During the research, 13 characteristics of restaurant management information systems were revealed: 5 major and 8 additional. These characteristics were analysed and

further 9 of them (4 major and 5 additional) were used to create the restaurant management information system selection model. For the purposes of simplification of the algorithm and avoiding duplications of the branches of the decision tree, variables were used. The questions on which the developed model is based are simple for understanding for an ordinary person and do not require special knowledge in the field of information technologies.

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1 INTRODUCTION

1.1 Background

Information technologies (IT) recently became deeply involved in people's life. ITs become less expensive, more powerful and much easier to deploy. ITs spread not only to everyday people's lives, but also in most business areas, such as: medicine, banking, insurance and security, manufacturing and so on. Restaurant business is not an exception in this list. Restaurants can be classified differently, for instance: by the price segment, by cuisine, by occasion, by chain existence, and many others. Within the frames of current research, full-service medium-priced and already existing restaurants will be considered. It is, moreover, will be useful and suitable for newly opened establishments or for those planning to be opened and these groups of restaurants are as well targeted by this study. The main point here is the long lasting perspective to stay on the market. This very particular interest is intended by the increasing popularity of food services providers in Saint Petersburg in recent years.

1.2 Research problem and objectives

Information technology solutions nowadays are dedicated to bring so many benefits for the users, dependent upon the goal and expected results of the activity. Finance, logistics, warehousing, client loyalty groups, various statistics and others are the features, which business is very cautious with. The implementation and usage of appropriate information system may allow for better set-up of business activity with accent on necessary key areas.

Although, there are so many different studies, concerning the benefits of information systems implementation in different business spheres, and in restaurant management in particular, there is still an issue in the question of how should the restaurant management choose the appropriate information system, so that it fits establishment's needs best?

No doubt that IT implementation results in advantages for the establishment, but there are several areas to be considered, whilst predicting the competitive advantage. Among them,

analysis of information technology decisions; implementation of information technology applications; development of information technology capabilities and competences (Bilgihan, Okumus, Nusair, Joon-Wuk Kwun, 2011). Current work will be focusing on the selection part, including research of full-service restaurant management information systems and their features, and implementation of flow chart model selection model.

The aim of the current research is to introduce the defined tool in a form of flow chart model, so that to enable management adjudge about what information system should be introduced under current circumstances and needs of the restaurant. The research is based on comparison analysis of restaurant management information systems and expert opinion of several restaurant management teams. The research questions of this study are:

1. What are the full-service restaurant management information systems characteristics that do affect the selection process?
2. How do restaurant establishments select information systems?
3. How to select an appropriate full-service restaurant management information system?

The research purpose is to be achieved through several tasks:

- perform analysis of existing corporate information systems and distinguishing those that are appropriate for restaurant business;
- interview with restaurant management people;
- construct the flow chart model for full-service restaurant.

1.3 Organisation of the study

The study has the structure, which can be described in brief as follows: the first chapter is focused at describing the full-service restaurant management information systems; defining what the full-service restaurant management information systems are, their peculiarities and what full-service restaurant management systems are used for.

In the second chapter the emphasis is put on describing business research methods, collecting data for flow chart model creation, performing and processing interview with restaurateurs

and managers in order to identify how the selection process is performed and what are the key factors in implementing the information system in restaurant establishment.

In the third chapter the information system selection model is developed, based on the interview results and content analysis. This model is developed to assist in decision-making process of full-service restaurant management information system selection.

2 THEORETICAL REVIEW OF FULL-SERVICE RESTAURANT MANAGEMENT INFORMATION SYSTEMS

2.1 Full-service restaurant management information system and its importance

2.1.1 What is full-service restaurant management information system

Full-service restaurant industry consists of establishments, whose primary field of activity is connected with providing food services to clients, who order and are further served whilst sitting and pay after eating. Such establishments may provide food services in combination with alcoholic and non-alcoholic beverages. Moreover, they may offer take-away and/or present entertainment programs (Definition is provided by North American Industry Classification System (NAICS) 2007). Restaurant industry is constantly growing with restaurants and cafes comprising almost a half of total industry value (Market Line Europe Industry Profile, 2015). Industry itself consists of such sub segments as restaurants and cafes, drinking places, fast food. Segment "others" includes delivery, take away, catering and self-service. Sales through vending machines are not included in the report since they are hardly measured. Value industry distribution is presented on figure 1.

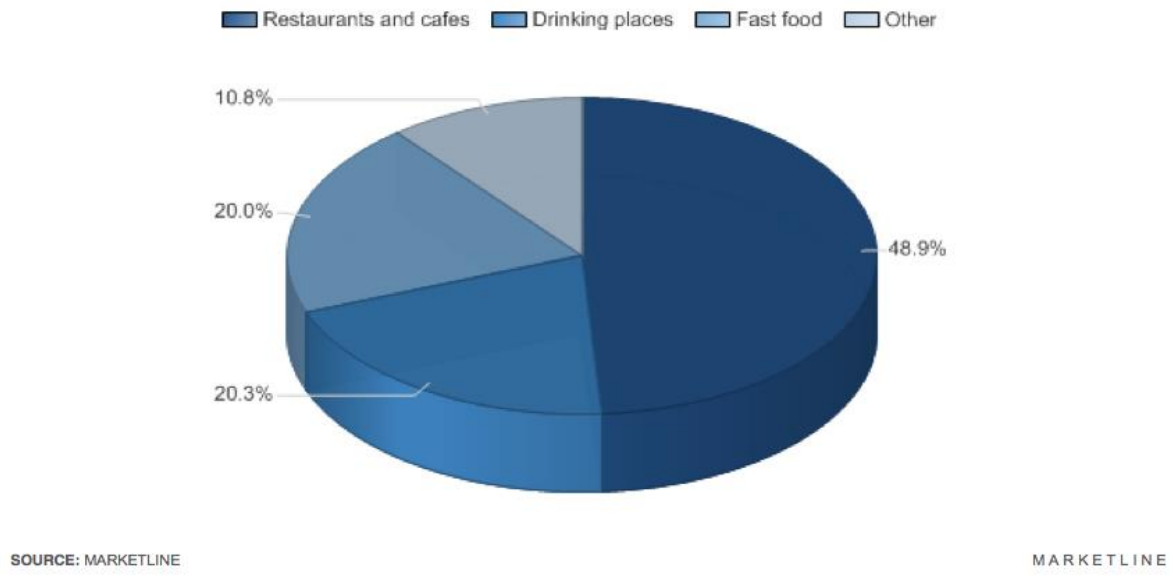


Figure 1 Value distribution (Source: Market Line Europe Industry Profile, 2015)

Full-service restaurant industry is considered to be low margin, highly competitive, with moderate buyer and supplier power, high threats of new entrants and substitutes (Market Line Europe Industry Profile, 2015).

According to the statistics, in the year of 2015 full-service restaurant industry was composed of 1.134,2 in China, 101,4 in Japan, 258,7 in the USA, 48,9 in the UK, 61,5 in Germany, 116 in Russia, 47,7 in France and 48,5 in Italy thousands of establishments among world biggest countries (World industry and market outlook, NAICS, 2015).

Restaurants nowadays become one of the main elements of leisure activities for people. Since full-service restaurant industry is very human-oriented, performance quality of all the internal operations is of high significance, since that is what results in a client's "experience, which leaves a lasting impression" (HM&M, 1995). This plays a vital role not only in reputation of restaurant, but also in quantity of returning customers. This group of clients is a major source of sales for the restaurant. Management is cautious on praises and complaints, competitors' actions and market situation so to make as much clients return as possible.

On the other side, full-service restaurant industry is a labour-intensive, which means that restaurant performance highly dependent upon people. Thus, restaurant activity should be organized in a manner so that to strictly distinguish rules and duties.

As of challenges of the full-service restaurant industry, "restaurants can close for a myriad of reasons" (Fairfield County Business Journal, 2016). It is a business, like any other, but the degree of closeness of customer makes it vulnerable. Moreover, the degree of interconnection of operations is that high, so in order to tackle with one problem, the overwhelming approach is needed. Thus, most of the problems need interdisciplinary strategy (Wiley-Blackwell, 2001).

Full-service restaurant industry is known for its fast speed of growing and diversity. Nevertheless, despite the location and type, main internal operations stay changeless from establishment to establishment. With the emergence of information technologies (IT), processes of planning, performance and control for management became much more easily guided and lead.

As any business, restaurants consist of processes. According to Porter's theory (Porter, 1985), there are three main groups of processes: primary, supportive, and developing. Primary processes can be described as main and overwhelming processes, which are connected with every part of establishment horizontally, from client to suppliers, and which add value to organization and products from customer's point. Example: food preparation, client service, order performance. Supportive processes are not creating value, but are important for stable functioning of primary operations. Example: human resources management, information systems, financial flows management. Developing operations are addressed to develop primary and supportive operations. Example: personnel trainings. Main restaurant processes include order handling, order preparation, and order payment. In the back office, there are inventory handling and managing, bookkeeping.

According to Johnston and Morris (1987), there are three main types of operations: material processing operation (MPO), customer processing operation (CPO), and information processing operation (IPO). On the other side, there were Hayes and Wheelwright (1984), who proposed five types: from continuous to project, ranging based on volume and variety. Jones and Lockwood (2000), however, combined these two approaches: they suggested operations to be classified either CPOs or MPOs. If the process lies in both categories, then it should be divided respectively and categorized accordingly. Jones (1993, 1996) and Jones and Huelin (1990) have classified foodservice operations based on system design, technology and configuration. They defined 10 sub-systems, like storage, preparation, cooking, holding, transport, regeneration, service, dining, clearing and dishwashing.

Nevertheless, despite the name and classification variations, current study is mainly aimed at information systems, at information systems selection process in particular, which results to be, according to Porter, supplementary operations; according to Johnston and Morris (1987) – information processing operations (IPO).

Power and capabilities of computers have created trends, which are still workable within the hospitality industry: operational and financial performance controls. Early computer systems' providers did not understand the practices of hospitality and thus the needs of appropriate information systems, but that has changed since (Parker, O'Brien, 1988).

Nowadays, there are products, which are easy to use, flexible and affordable on the market. Early point-of-sale systems appeared first at 1980s, and were transformed from retail industry. They eased the work – allowed personnel not to remember every item's price. Moreover, it became easier to change and customize prices. In 1990s, the integration of point-of-sale and back office operations began. Furthermore, the information systems were no longer necessarily customized: functions remained the same (Ansel, Dyer, 1999). It should be noted that all these systems were necessarily computer-based.

Fully automated systems in the hospitality industry first appeared in hotels (Axinte G., 2009). Evolutionary path of full-service restaurant management information systems began with several independent programs, which enabled automation of such processes as bookkeeping, inventory handling, and check-out desk management. Moreover, these programs were for own use and owners had little concern for integration. Further, these parts were organized under one information system, which was specifically set up for a particular establishment. Later, more operations were added and automated, such as order taking, inventory management, and others. While restaurant business development in Russia in 1990s, Western Europe countries already had implemented information systems in full-service restaurant industry. By the time, restauranteurs recognized the special features that restaurant information systems can assist with – client relationship management operations (Ansel, Dyer, 1999).

Full-service restaurant management information systems during the evolution periods included several important functions, which have changed the way restaurants operate. Until now, these functions stay undoubtedly crucial for performance and control:

1. Point-of-sale systems – heart of establishment's information contribution. Provided such functions, as menu tracking (recognizes most and least popular items); reporting capabilities; meal duration tracking.
2. Table management systems – were designed to track and improve service and speed turns. Floor plan management and waiting list functions were offered.
3. Order entry systems – shows availability of possible menu items and order tacking process.
4. Production support systems – allows for eased integration with reporting and reservation functions.

The main goal of contemporary full-service restaurant management information system is to provide accurate and up-to-date information about production, handling and labour costs; performance indicators, such as sales, return on investments, and losses; and to assist in managing everyday repeated operations, such as scheduling, table management, and point-of-sales access.

Despite the fact that this concept is widely spread and used, in the academic research there is no agreed definition about what the full-service restaurant management information system is. Thus, while analysing the functions, purposes and aims of the information system, in this study author proposes own formulated definition: full-service restaurant management information system is an information system, not necessarily computer-based, that allows processes automation that enables personnel to perform regular internal operations faster and more accurate, and assists managers in decision-making and control over operations.

Full-service restaurant management information system implementation is important and most of the times costly decision, which, on one hand, may be considered as an excessive for a restaurant, since all the operations used to be performed manually previously. For that period, winning and losing sides in the competition are basically defined by the ability of managers and owners to analyse the data, to react and to make decisions (Nation's Restaurant News, 2006; 2009). There are several advantages that can be met by automating some important business features (ZipSchedules, 2016):

1. Workforce management – nowadays, full-service restaurant management information systems enable to store, update, and change employee information quickly, to keep contact details, and to automate scheduling, payrolls, therefore reducing paperwork, printed materials, and storage space.
2. Inventory control – usually considered to be one of the costliest field in the establishment. The usage of information systems allows to see a bigger picture by considering the overview of the stock, replenishment points by the individual product categories, waste, and theft.
3. Tracking of sales – unlike the traditional cash desk, restaurant management system tracks all the transactions till the penny, so to report the up-to-date

information at any time. Moreover, this enables to identify most and least popular menu items, thus to adjust the menu in a proper way.

4. Financial reporting – full-service restaurant management information systems may track all the transactions performed and thus prepare profit and loss statements, tax statements and others. Moreover, the overall performance reporting allows in management activity assessment and decision-making.
5. Security – modern point-of-sale desks are equipped with access controls, therefore the safety of cash desks increase.
6. Off-site control – full-service restaurant management information systems may allow for offline control of establishment's performance for managers and owners via internet connection to the personal account. This enables to review the activity, inventory, sales, labour shifts, and so on.

2.1.2 Importance of full-service restaurant management information system implementation

Full-service restaurant management information systems are gaining popularity and acceptance not only from the business people in the industry. Implementation of such a system allows for benefits experience, several of them were discussed above. Among opinions, there are several points of view. Liddle (2002) believed that more than 50% of all the further industry changes will be associated with technology. These changes will allow to control costs, react in real time to profit/loss mechanisms, and enhance management techniques. Ansel and Dyer (1999) and Guo (2015) stated that full-service restaurant management information system can provide four benefits: minimization of costs, better employee management, revenue and competitive advantage management, and ability to analyse clients' preferences and adopt menus towards costs.

As stated by Hayes (2002), customer feed-back mechanisms looked like "comment cards" and "mystery client" approaches, which tent to be not very useful and effective in terms of responsiveness. At the moment, real-time guest satisfaction/complaint reports being send in the system and directly to the managers (Yau, 2014). This has decreased processing time of a report (Liddle, 2001). With the help of technology-based solutions, establishments started to receive greatly more responses, upon which then correlations in menu and operations are

made, and which are analysed and stored in the customer relationship management (CRM) computer software (Frumkin, 2002a).

As another group of scholars state, information technologies, which are implemented in restaurant management, are associated with increase in repeat business. One of that area is an online reservation system (Ruggless, 2003). Software providers enable clients to perform reservations manually online. Several operators stated that they faced a 30% increase in their reservations rate (Ruggless, 2003). Moreover, there are web-based services that allow to develop flexible pricing menus, for instance, for off-peak hours, to introduce special pricing promotions (Fangpei, 2011). One provider of such a system reported that, on average, the usage of special time pricing has increased customer data base by 400 clients (Liddle, 2003).

Another group of benefits is connected with marketing and service management. Prewitt (1997) stated that close connection with customer relationship management (CRM) programs allows to collect, store, and analyse specific information about customers, their preferences, consumption patterns, reports, surveys, and point-of-sale data, which later could be used in order to manage product positioning more effectively and promote special deals (Yau, 2014). Moreover, improvement of speed and quality of service is as well important. Restaurants started to use handheld devices in order to signal on empty or dirty table, to place the order (Frumkin, 2002b). Such technologies assisted restaurants in increasing speed of service and table turnover speed (Prewitt, 2003). The best way to use restaurant management systems is to compliment the personalized service (Maras, 2016). Technologies can help to reduce service time and order handling, provide more accuracy than any human being do (Berry, 2001).

Until recently, there was so called “multiple approach” to the use of full-service restaurant management information systems. Establishment were assisted with several systems at a time, each of them was referred to one particular function, such as: one for payroll software, another one for inventory controls, the third – for point-of-sale and so on. Contemporary information systems provide integrated solutions, which can run several functions on a single platform. So called Application Service Providers (ASPs) offer restaurants management systems to implement to manage operations (Liddle, 2001). There are as well software providers, who aid with labour, inventory and food costs, profit and loss

management and sales anticipation (Nation's Restaurant News, 2003b). To boost sales restaurant management can use Restaurant Revenue Management (RRM) (Kimes and Thompson, 2004; Susskind et al., 2004).

One group of scientists state that restaurant establishments start to implement workforce solutions in order to assist in training and selection processes (Owens, Baqir, 2014). These are specific tools with emphasis put on personality, traits and skills for every kind of personnel: back office, front office, and managerial positions. Such information systems may assist in hiring the right person for the right job (Liddle, 2002). Such Human Resource Management (HRM) systems are integrated with payroll and reporting services, which allow for better decision-making. Through connection with HRM, establishments can manage employees' behaviour and working environment that results in overall success (Koys, 2003).

According to CNews (Karachovsky V., 2008), contemporary restaurant information systems allow not only for routine tasks, but also for specific tasks force simplification and time acceleration.

Firstly, restaurant management systems can formulate menu recipes, according to the available product list. They automate menu items list with respect to resources expenses, seasoning issues. Contemporary restaurant management systems define ingredients consumption, they automatically integrate this information with inventory part, which update the storage information. Thus, the first price and profitability can be calculated considering all the food resources used (Karachovsky V., 2008).

Secondly, the integration possibilities with other establishments, such as hotels, wellness, shopping or business centres. The need of customer identification and analysis may be performed via integration of data bases. Here, as well, could be considered special exotic cuisine. For instance, Italian restaurant may prepare customs or logistics documentation with the help of restaurant management systems. Undoubtedly, integration is vital when it comes to coordination and control of several establishments (Karachovsky V., 2008).

Thirdly, customer relationship management features could be accessible with the help of restaurant management systems. Client data base, loyalty program, bank promotions – are all the occasions, when restaurant management system implementation turns to be beneficial

for the establishment. Creation of loyal customers' data base and attraction of new ones is a smart step with the help of information system. Moreover, credit card accessibility with special promotions and payment conditions positively affect the loyalty of clients (Karachovsky V., 2008).

In summary, studies show that there are hugely tangible benefits to be achieved whilst implementation and usage of full-service restaurant management information systems. Among them, minimization of costs: food, labour, beverage; employee management practices; increasing revenue; ability to analyse and process clients' preferences in order to react accordingly. Moreover, there are such possibilities as quick access to sales tracking, reporting and overwhelming inventory control. The usage of information technologies, furthermore, enables to save papers and space, while keeping track of establishments' operations, workforce documents, and others. In addition, contemporary full-service restaurant management information systems allow to implement security controls, such as access levels to point-of-sale desk. Despite the fact that investment decision seems essential after the overwhelming list of benefits, there are still companies that do not decide to pay for restaurant management system implementation.

2.1.3 Full-service restaurant management information systems classifications

Nowadays there is a great range of full-service restaurant management information systems, which are available on the market. Thus, there are various classifications of them among researchers. Since there are quite a lot of opinions and views, sometimes it is complicated to relate the theories of different researchers.

Although, in general, as information technologies developed with the time, there is one common approach to classify contemporary full-service restaurant management information systems. As reported by Transparency Market Research agency in 2016, there are a lot of players on the market, who provide restaurant management solutions. The service can be distinguished and classified by the segment of usage: by hardware, by software, and by services (Transparency Market Research, 2016). The description of each segment is provided further and based on report, published by Transparency Market Research agency in August 2016.

Hardware solutions

As it was mentioned above, the early full-service restaurant management information systems used to be computer-based and used to perform, at the beginning, only one operation and, with the time, several functions at one machine. They were customized and one solution did not suite every establishment (Ansel, Dyer, 1999). Although, today machines are very smart, fast working, intuitively understandable, and most of the times are set-up and employed easily. What is more, they are affordable (Goldsborough, 2000; Tanyeri, 2007). It is worth saying, that hardware, in the context of this study, can be defined as physical computer equipment or device.

According to the Transparency Market Research report, there are several components in the segment of the hardware solutions. Among them:

1. signage systems
2. kiosks
3. drive through terminals
4. point-of-sales
5. handheld devices
6. digital menu cards

All of these are physical devices, which, though, operate under the preinstalled software, provided by the vendors of full-service restaurant management information systems. They can combine several functions at one machine. These were the devices, which were employed at early stages of computer development and implementation in full-service restaurant industry.

Software solutions

Essentially, software is a complex of program, data and computer device, which operate, store and process upon requests. Neither hardware nor software can operate separately and be used on its own. Although, nowadays software systems are not that strictly connected with one particular device only. Contemporary solutions provide opportunities to choose operating system, under which it is preferable to work, for instance, Windows, iOS or Linux.

Software solutions nowadays may provide the following functions (Transparency Market Research, 2016):

1. front of house
2. inventory management
3. reconciliation
4. labour management
5. HR software
6. data analytics
7. marketing
8. restaurant operation
9. support operation
10. franchise management

All of these separate software is available not only individually, but in a bunches of required functions, dependent upon full-service restaurant management information systems providers. Moreover, information systems vendors nowadays provide applications for smartphone and tablet devices, which combine most popular and useful functions.

Services solutions

Services solutions are gaining more and more popularity and are on high demand. Service-oriented architecture (SOA) is a style in creating Web applications based on services (Aljazzaf, Capretz, Perry, 2015). "There are three interaction roles in SOA: the service provider, which owns, implements, and controls access to the services; a service requestor, which is an application, service, or client who is searching and invoking a service; and a service broker that groups all of the services together and maintains a registry of available services" (Aljazzaf, Capretz, Perry, 2015; Papazoglou and Georgakopoulos, 2008). According to the Transparency Market Research report, there are such solutions as Cloud and network. These latter elements played vital role on the contemporary full-service restaurant management information systems development, their characteristics and usage, and constitute modern peculiarities of full-service restaurant management information systems in general.

As for the purposes of current study, only software and partly services solutions will be considered. Since nowadays people are widely using various computers and technology

devices, hardware solutions stand out on the back. Nevertheless, point-of-sale cash devices are part and parcel, despite the technological development nowadays.

2.2 Peculiarities of contemporary full-service restaurant management information systems

There are dozens of full-service restaurant management information systems exist on the global market. However, there are specific features, which are connected only with contemporary information systems, compared to the primary ones. Among them, there are Big Data and Cloud computing, which influence the whole system a lot. These features bring much more opportunities while utilization. In the current section these contemporary technologies are defined and observed. Moreover, their opportunities, peculiarities and challenges are described.

2.2.1 Big Data

Until recently, Big Data term was considered to be something "too big to fit in an Excel spreadsheet" (Brooks, 2016). The amount of information, which is transferring in the full-service restaurant industry is only growing and it is important not only to get the information, but also to get as much as possible out of data. In 1975 there were only 50,000 personal computers in use around the world. In twenty years the amount increased up to 225 million. For comparison, in 1995 the number of internet users was 16 million. Nowadays it is more than 3 billion (Martinez, 2014). There is an estimation of 26 billions of mobile devices to be used by the year 2020 and generate the traffic to contribute it to the Big Data (Middleton, Kjeldsen and Tully, 2013). The conception of "Big Data" refers to the aggregation of large data complexes, which are "beyond traditional data management systems' capabilities to store, manage, and process it in a timely and economical manner" (Patil and Seshadri, 2014).

Studies by Restaurant Business, a grave industry guide, (Kooser 2013; Brooks, 2016) have identified several restaurant management fields, where Big Data can assist in, such as menu analysis, labour costs reduction, servers' productivity and customer profiles.

Menu analysis

Usually, restaurant menu constituted of several categories of dishes, like, for instance, salads, starters, main courses, desserts and drinks, with a number of items in each group. Point-of-sale systems are usually used to type the data in the software program in order to print the guest check later. But that is not everything. With this point-of-sale system, it is

possible to track sales on every menu item, perform statistics and analyse, for instance, pricing strategies to be implemented. This is an example of the Big Data. With such a guest tracking information, managers can tune the menu prices and coordinate offered items in there. Most Big Data features are initially implemented in the contemporary point-of-sale systems, so the most essential way is to begin with it. Since many providers have recognised the utility of point-of-sale systems, they are usually already featured with statistics and reporting options to track sales and assess promotion results. Compared to founded practices, it takes only days to make a decision about performance results, not weeks.

Labour costs reduction

There are two critical fringes in the labour management sphere: understaffing and overstaffing, and these both usually cost a lot. In order to correlate with the overall restaurant performance dynamics, several full-service restaurant management information system providers introduced workforce packs. These features provide shift alerts for staff, can create schedules, in accordance with both sales forecasts volumes and shifts peculiarities. With the help of the labour package, it is possible not only to set the schedules, but also to use present data to be one step ahead.

Servers productivity

As it was stated before, point-of-sale systems are much more than simple desk. Here is one more approval of this statement. It is quite a fuzzy task to evaluate the effectiveness of servers. Though, Big Data approach can assist in this question. The usage of point-of-sale historical information can show, besides of the average checks, tips amounts. This measure can help assess clients' satisfaction. What is more, the time spent at a particular table can be a signal of server's rush or sloth. Although, despite the fact of analysing performance reports, there is an issue of arising competitiveness, while the results are publicly discussed. Moreover, people can start fighting for more productive shifts to work in. In order to overcome these issues, there are several strategies, which can be implemented:

1. turn competition into game pursuit – the idea is to assess performance periodically (weekly or monthly) and, at the end of reporting period, to praise the best resulted servers;
2. personal teaching – the idea with this option is in publishing personal results on a period basis and then to motivate personnel improve their scores;

3. command learning – servers with best reports perform educational trainings for colleagues in order to share the experience and improve the overall performance.
4. The overall idea is in keeping the approach positive and motivate the staff to improve their personal and collective results, so that the business will benefit more.

Customer profiles

Here is one more thing, where Big Data can assist in. Considering all the parties as important (no servers – no service; no cookers – no food, no managers – no control and so on), clients are the only ones, who actually bring business their money. Point-of-sale systems in this point are again in play. By collecting the data about patrons, such as dishes and drinks ordered, time spent at a table, favourite visiting times and so on, restaurant managers can evaluate their most profitable and frequent clients and track the attendances. If someone is missing for a period of time, managers can send a very personalised e-mail with an invitation to revisit the restaurant. Such customised approach usually brings customers back, since it is a pleasant for a client to be important known.

Big Data poses both serious challenges and prospering opportunities at the same time. On the one hand, the amount of tricks to be analysed with the help of data usage is impressive. The right approach to the data can assist managers in increasing performance indicators and improving control mechanisms.

On the other hand, one of the challenges of Big Data is connected with actual amount of data. It is important to distinguish only useful information, consider and analyse it in order to provide actionable insights. The best way to deal with such a data massive is to split it into small pieces of data amounts. Kooser (2013) stated that the concept of Big Data is not that pretty itself, since it works if and only the data is processed and transformed.

2.2.2. Cloud computing

Cloud computing is a new, though already widely spread, concept, which represents collaboration among multiple computers and network services, and provides on-demand services to the users (Milani and Navimipour, 2016a). In other words, it is a totally web-based resource. Researches have distinct four types of cloud services, dependent on the

access level: private, public, community and hybrid. As it can be gathered from the name, private clouds work only with one establishments and impose strong security. Public cloud could be used by public or industry society group. Community cloud is accessible by several establishments, which share the same interest. Hybrid clouds share two or more features of cloud types (Bamiah et al., 2012).

There are four types of cloud services: Software as a Service (SaaS), Infrastructure as a Service (IaaS), Platform as a Service (PaaS) (Navimipour et al., 2015; Navimipour and Zareie, 2015), and Expert as a Service (EaaS) (Ashouraie and Navimipour, 2015; Milani and Navimipour, 2016b; Navimipour, 2015a).

Software as a Service (SaaS) enables clients with the Internet connection to access applications and not experience difficulties and high costs (Wu et al., 2012). Infrastructure as a Service (IaaS) supplies services with basics, such as hosting and hardware, so to ensure stable run of a cloud (Manvi and Shyam, 2014). Platform as a Service (PaaS) it is an environment, in which applications are developed, tested and employed in (Foster et al., 2008). Expert as a Service (EaaS) procures experts with special knowledge to the user as a service. Although, cloud computing is highly developed, it is a challenge to find a suitable for it server (Buyya et al., 2008). There are several benefits, which distinct Software as a Service (SaaS) from other types of cloud services. Among them there are zero infrastructure prerequisites, low costing and easy implementation and employment (Zhu, 2014). That is why Software as a Service (SaaS) will be further analysed in a context of restaurant management.

Such SaaS technologies are becoming common among small and medium sized enterprises (Xu et al., 2013).

According to Taft (2011), moving business parts to the cloud has several advantages, which are only achievable with the usage of SaaS system. Firstly, cloud facilities cut costs. There is no need to invite information technology specialist in order to tackle with problems. Moreover, there is a huge economy on procurement and maintenance of hardware. Secondly, it is possible to form the pack of features and adjust it further at any time, depending on the needs of the management. So, flexibility is one more benefit. Finally, a majority of cloud

solutions vendors are providing an access to the servers at one-for-all license. It means that there is no need in buying the licensing for using several devices. The payment for the use enables to connect to the system at any time.

2.3 Research gap

The main research area within the confines of current topic is constitutes of such sub-areas as restaurant management practices and information technologies. There are as well contemporary features, such as Big Data and Cloud computing, which affect the internal processes and transfer the initial practices.

Management systems are rarely researched, since it is more a technical area, which has less common with management practices and expertise, but more with engineering and know-how (De Bruijn et al., 2001). Although, there are scholars, who investigate this very narrow topic of restaurant management systems. Despite the fact that the full-service restaurant industry is very human-oriented (HM&M, 1995), it is becoming a technology-intensive (Wiley-Blackwell, 2001). Thus, competitive advantage relies heavily on the ability of the establishment to implement and employ the appropriate full-service restaurant management information system (Nation's Restaurant News, 2006; 2009).

There is vast amount of studies, considering, for instance, the benefits of full-service restaurant management information systems implementation. These are Liddle (2002) and Ansel and Dyer (1999), who believe that information systems will be the core reason for the transformation of the industry practices. Benefits and importance – are the features, studied by many scientists (Guo, 2015). Ackere, Delgado, Larsen (2015), Hays (2002), Liddle (2001), Frumkin (2002a) and Yau (2014) have studied the client orientation side and client relationship management (CRM) approach of restaurant management systems. Prewitt (1997, 2003), Frumkin (2002b), Berry (2001) and Maras (2016) investigated service management features, which enable personnel to create a great service experience for patrons and increase table service turnover.

There are studies of Ruggless (2003), Liddle (2003) and Fangpei (2011), who are considering how online reservation systems affect the clients' base and attendance frequency to a particular place, implementing online reservation systems.

Kimes and Thompson (2004) and Susskind et. al (2004) studied the topic of restaurant revenue management (RRM) practices, such as labour, food and inventory costs, profit and loss management.

Koys (2003) and Liddle (2002) provided reviews of human resource management (HRM) practices, how they are implemented in full-service restaurant management information systems, and what they are used for in the context of restaurant establishment processes of hiring, training and position shifting.

Although, there are studies about advantages and opportunities of full-service restaurant management information systems exist, there is quite a limited number of researches, performed about information system selection process. Figure 2 below illustrates the stated research gap.

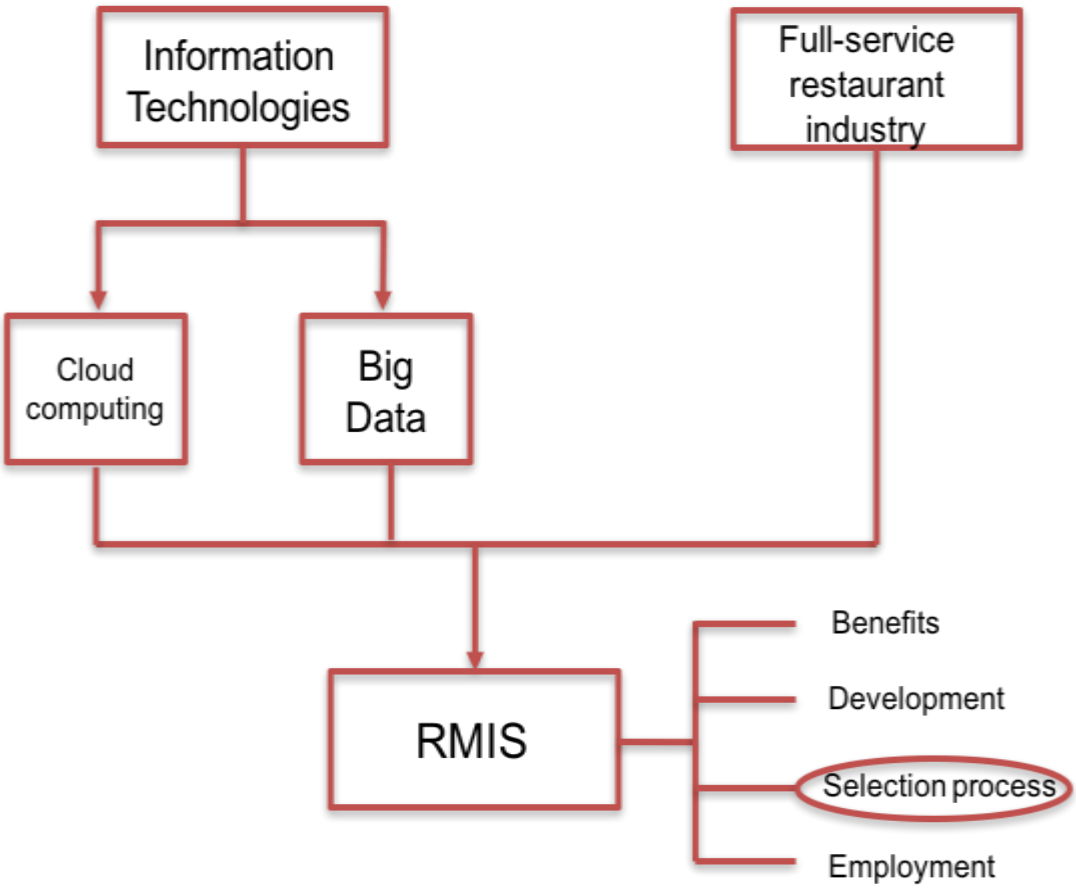


Figure 2 Research gap (composed by the author)

From the company's perspective, the selection process of information systems plays a vital role. The chosen system could not be fitted in the organisation, if the selection process was performed unconsciously, without paying proper attention to investigation of information systems market (Bilgihan, Okumus, Nusair, Joon-Wuk Kwun, 2011). As a result of the wrong approach, the full-service restaurant management information system would not fit in the establishment and would not fulfil the necessary requirements. For instance, it may lack or excess some functions.

As it was stated above, full-service restaurant management information systems can have a great variety of functions. From one point of view, it could be assumed that the selection process is easy enough, since more or less, the functionality resources are similar. But, in reality, the process of selection affects heavily implementation and further employment of such a system. Moreover, the implementation of full-service restaurant management information system decision will surely reflect the profit/loss statement of the establishment, as this investment is expensive.

Considering all the stated above arguments that selection of information system is a vital process, the purpose of this current research is to assist in the decision-making process, by developing a full-service restaurant management information system selection model. The research is based on comparison analysis of 40 multinational full-service restaurant management information systems and expert opinions of several restaurant establishments that already have experience in full-service restaurant management information system employment.

The research questions of the current study are:

1. What are the full-service restaurant management information systems characteristics that do affect the selection process?
2. How do restaurant establishments select information systems?
3. How to select an appropriate full-service restaurant management information system?

As a result of this study, the full-service restaurant management information system selection model will be developed. This model will assist restaurant establishment

representative or responsible person in the selection process to choose from a vast amount of market offerings the one, which would suit best the needs and requirements.

2.4 Summary

The use of information systems is widely accepted and is playing a significant role in achieving competitive advantage and operational benefits. Although, in the academic research there is no agreed definition about what the full-service restaurant management information system is. For the purposes of current research, the definition was developed: full-service restaurant management information system is an information system, not necessarily computer-based, that allows processes automation that enables personnel to perform regular internal operations faster and more accurate, and assists managers in decision-making and control over operations.

The main full-service restaurant management information system benefits, emphasized by researchers, are as follows:

1. minimization of costs, associated with food, services and labour;
2. employee management practices;
3. increasing revenue;
4. ability to analyse and process clients' preferences in order to react accordingly;
5. saving papers and storage space;
6. overwhelming control over inventory;
7. quick access to reporting features;
8. increased security.

Modern technological tendencies have influenced full-service restaurant industry's approaches to full-service restaurant management information systems. Big Data and Cloud computing have introduced brand new means for full-service restaurant management information system providers and opportunities for the market players in the industry.

The market is full of supply, providing an enormous amount of offerings. Both, Russian and Foreign markets of full-service restaurant management information systems compete and update their services and solutions.

This study is focused on the full-service restaurant management information system selection model development process. This model will assist restaurant establishment

representative or responsible person in the selection process to choose from a vast amount of market offerings the one, which would suit best the needs and requirements.

3 METHODOLOGY OF FULL-SERVICE RESTAURANT MANAGEMENT INFORMATION SYSTEM SELECTION

3.1 Methods of business research

Research methodology is a systematic plan of doing research: collecting information and data in order to solve research problem. Research methodology, in other words, includes a combination of research methods to study research questions and answer them (Rajasekar et al, 2013). Despite the fact that there is a great number of research techniques exist, within the confines of current study, only two methods will be used: content analysis and in-depth interview.

As it was stated above, there are three research questions to be answered during the research of current study:

1. What are the full-service restaurant management information systems characteristics that do affect the selection process?
2. How do restaurant establishments select information systems?
3. How to select an appropriate full-service restaurant management information system?

In order to answer the first research question, the content analysis was performed. Content analysis is constituted of existing full-service restaurant management information systems observation and analysis of their characteristics. This research method is commonly used for qualitative research (Kothari, 2004). The analysis of full-service restaurant management information systems was performed with the help of web-sites and reviews and is presented in a form of the table.

The second research question is answered with the help of interview, conducted to gather information about selection criteria, expertise and experience in restaurant information systems employment. There are two types of questions were used: open and closed questions. Open questions are engaging people to respond with the characterisation of situation in a describing manner. Whereas multiple-choice or closed questions are dedicated to confirm facts and characteristics and to gather specific data (Folkestad, 2008). The

questionnaire was performed in advance and was used to identify specific options, selection criteria and important information system features, while choosing the full-service restaurant management information system.

In order to analyse the results, the traditional method is used, since the number of respondents is 5, which is less than 40 (Adams et al., 2007). Cross-case method is used to analyse the results, because it enables to generalise gathered information (Miles, Huberman, 1994) and at the same time it requires clear conditions for respondents' selection and structures interview (Folkestad, 2008). Performed interviews were in advance prepared and have a logical structure. There are 20 questions. Moreover, there are several requirements to the respondents imposed: an interviewee should have been involved in a decision-making process and establishment should have already implemented full-service restaurant management information system. More detailed and comprehensive description of research methods, which are used, is presented in the following section of current chapter: 2.2 and 2.3.

3.2 Comparison analysis of full-service restaurant management information systems

In order to create full-service restaurant management information system selection model, the clear understanding of nature and peculiarities of full-service restaurant management information systems is needed. To study what the full-service restaurant management information systems are and how they work, a content analysis of existing full-service restaurant management information systems was conducted. 40 various information systems were discovered, analysed and then compared by features, and, as a result, a comparison table was performed. Observed information systems are originated in different countries: The USA – 19; Russia – 8; Ukraine – 5; Canada – 3; India – 2; Bulgaria – 1; Australia – 1; Lebanon – 1. A part of the comparison table is presented below on figures 3 and 4.

	A	B	C	D	E	F	G	H	I
1	**Name**	**Country**	**Inventory M.**	**Kitchen M.**	**Waitstaff M.**	**POS**	**Table M.**	**Sales Tracking**	**Food costing**
2	**eZee Burrp**	India	+	+	+	+	+		+
3	**BIM POS**	Lebanon	+	+	+	+	+		+
4	**Toast POS**	the USA	+	+	+	+	+	+	+
5	**Brigade POS**	the USA	+	+	+	+	+	+	
6	**Breadcrumb**	the USA	+	+	+	+	+	+	
7	**TouchBistro**	the USA	+	+	+	+	+	+	+
8	**Maitre'D**	Canada	+	+	+	+	+		+
9	**Kounta**	Australia	+	+	+	+	+		+
10	**Tap Hunter**	the USA	+	+	+	+	+		
11	**Oracle Hospitality POS**	the USA	+	+	+	+	+		+
12	**AccuPOS**	the USA	+	+	+	+	+	+	
13	**Aldelo**	the USA	+	+	+	+	+		
14	**Mirus Enterprise**	the USA	+	+	+	+	+		+
15	**Aireus**	Canada	+	+	+	+	+		
16	**Diningedge**	the USA	+	+	+	+	+	+	+
17	**onePOS**	the USA	+	+	+	+	+		+
18	**HostMe**	the USA	+	+	+	+	+		
19	**Action Card**	the USA	+	+	+	+	+		
20	**BPA Restaurant**	the USA	+	+	+	+	+		+
21	**CostGuard**	the USA	+	+	+	+	+	+	+
22	**BarnetPOS**	the USA	+	+	+	+	+	+	+
23	**Resotto**	India	+	+	+	+	+	+	
24	**Traktir**	Russia	+	+	+	+	+	+	+
25	**iiko**	Russia	+	+	+	+	+		+
26	**R-Keeper**	Russia	+	+	+	+	+		
28	**Dinerware**	the USA	+	+	+	+	+		+
29	**PeachWorks**	the USA	+	+	+	+	+	+	+
30	**Compeat**	the USA	+	+	+	+	+		+
31	**1C: Establishment 8. Restaurant**	Russia	+	+	+	+	+	+	
32	**Poster**	Russia	+	+	+	+	+	+	
33	**Tillypad XL**	Russia	+	+	+	+	+		
34	**Quick Resto**	Russia	+	+	+	+	+	+	
35	**BIT. Appetit**	Russia	+	+	+	+	+	+	
36	**B52**	Ukraine	+	+	+	+	+	+	
37	**Frontol**	Ukraine	+	+	+	+	+	+	
38	**Microinvest**	Bulgaria	+	+	+	+	+	+	
39	**Galion-IT**	Ukraine	+	+	+	+	+	+	+
40	**SmartTouch**	Ukraine	+	+	+	+	+	+	
41	**BarBOSS**	Ukraine	+	+	+	+	+	+	

Figure 3 Comparison table of existing full-service restaurant management information systems – part 1 (composed by the author)

	A	J	K	L	M	N	O	P	Q
1	Name	Menu M.	Reserations M.	Payroll M.	Wat List M.	Self-service	Web monitoring	Deployment	
2	eZee Burrp		+	+	+			on premises	Windows
3	BIM POS		+					on premises	Windows, Mac OS
4	Toast POS	+	+	+	+			cloud	
5	Brigade POS	+						cloud	Mac OS
6	Breadcrumb							cloud	Mac OS
7	TouchBistro	+	+	+	+			cloud	Mac OS
8	Maitre'D		+	+	+			on premises	Windows
9	Kounta							cloud	
10	Tap Hunter	+						cloud	Windows, Mac OS
11	Oracle Hospitality POS		+	+	+			cloud	
12	AccuPOS							on premises	Windows
13	Aldelo							on premises	Windows
14	Mirus Enterprise		+	+	+			cloud	Windows, Mac OS
15	Aireus			+				cloud	Mac OS
16	Diningedge	+						cloud	
17	onePOS		+	+	+			on premises	Windows
18	HostMe		+		+				Windows, Mac OS
19	Action Card							cloud	Windows, Mac OS
20	BPA Restaurant		+	+				on premises	Windows
21	CostGuard	+						on premises	Windows
22	BarnetPOS	+	+	+	+			cloud	Windows, Mac OS
23	Resotto	+	+		+				Android
24	Traktir	+	+	+	+			cloud	Windows, Mac OS
25	iiko							cloud	Windows
26	R-Keeper	+	+		+	+	+	cloud	Windows, Linux
28	Dinerware			+				cloud	Windows, Mac OS
29	PeachWorks	+						cloud	Windows, Mac OS
30	Compeat			+				cloud	
31	1C: Establishment 8. Restaurant	+	+					cloud, on-premises	Windows
32	Poster	+						cloud, on-premises	Windows, Android, Mac OS
33	Tillypad XL	+						cloud, on-premises	Windows, Android, Mac OS
34	Quick Resto	+						cloud	Mac OS
35	BIT. Appetit		+					on-premises	Windows
36	B52	+	+						
37	Frontol	+						on-premises	Windows
38	Microinvest	+						cloud	Android
39	Galion-IT	+						cloud, on-premises	
40	SmartTouch							cloud	Android
41	BarBOSS	+	+		+			cloud	Android

Figure 4 Comparison table of existing full-service restaurant management information systems – part 2 (composed by the author)

There are several differentiating characteristics, which are important to consider. The first is operating platform. There are three types of platforms, upon which the programs are run: Microsoft Windows, Mac OS, and Linux. The most popular operating platform is Windows; it is compatible with the most of information systems. The issue of operating platform is significant to consider, because some companies may not have, for instance, Windows operating hardware and system preinstalled. This poses several difficulties, which are associated with costs. In order to run a Windows adapted program on Mac OS, there is a need to install additional software. Sometimes this solution may not be useful. What is more, such a distinction requires additional costs: additional software and installation work.

The second thing is deployment base. There are two deployment variations among which to choose: on-premises and cloud. The cloud-based deployment corresponds to the use of third-party servers in order to input, store and download information. This approach requires only Internet connection and some hardware: computers or some other connection devices. In contrast, on-premises deployment is different. In this approach clients should have their own hardware installed, such as computers and servers. These devices are used on an establishments' premises and are located there as well. The main differentiation lies in the data access. On cloud-based approach allows for information reachability from wherever with the Internet connection. In contrast, while the use of on-premises approach, information can only be reached directly from the main computer or via the local Wi-Fi network. Despite the fact that both of deployment bases have their benefits and drawbacks, there is usually a question arise, which confuses the management the most: what to choose. As the cloud-based technologies are contemporary ones, most of the times clients choose them even if it is not obligate.

There is a tricky issue in comparing the deployment bases. It is not completely correct to examine only subscription fees. There are several more features to consider. IBM Program Director (Cloud Delivery Platforms and Cloud Security Champion) Nathan Reid suggests five points to consider while choosing among SaaS and on-premises solutions.

1. *Focus = Success.* When installing the cloud solutions, the emphasis is put directly on business features and priorities and less attention is paid on infrastructure features. While, in contrast, if the IT team is experienced enough to deliver successful services, it is usually not a question whether the team will be sided with infrastructure issues instead of providing business value services.
2. *Previous experience*. According to the author, previous adoption experience plays significant role and influences future selection decisions. But here is one point: is this decision of cloud implementation just a followed path or a breaking ground opportunity.
3. *Integration.* Integration complexity is often a key reason why companies try to distance themselves from implementing cloud services. Such misconstructions are influencing the final decision. In reality, flexibility is offered by the most SaaS providers and proposed with variety of connectivity methods. Usually companies pay attention on the security of data and thus require regulatory obligations, while

transmitting data into the cloud. Thus, they do understand the risk profile. Although, vendors are operating on a highly secured approaches and auditors' controls ensure the data protection. The issue of data security is vital not only on cloud-based solutions, but also on-premises. The right knowledge guides the selection process and helps avoid misunderstanding. Infrastructure security requires considerable effort to get the right level of security in place, at the correct level, which is the key (Baxendale, 2015).

4. *Time to value.* Usually cloud-based deployments need noticeably less time, that on-premises solutions. The overall value consideration is, thus, can be seen sooner, since implementation time is lower. So, if the project is under a tight schedule, it is recommended to install SaaS. However, there are various factors exist, which can dictate the implementation procedure, and if the IT team is experienced enough, then equal time-to-value benefits may be achieved.
5. *Flexible payment options.* One of the main aspects to consider corresponds to the monetary issue. Financial aspect is usually the one that drives the final decision. The budgets are tent to be tightened, especially for the IT projects, which is why cloud can be a great solution in such a situation. Flexibility in payments, such as monthly or quarterly, is an offer of most vendors nowadays.

One more aspect to consider is appointed by Forrest Burnson, a Market Research Associate at Software Advice. He states that on-premises systems are generally considered to be capital expenditure, which means initial large investment up front; Cloud-based solutions are operating expenditure, which means an additional overhead cost that organization will continue to pay in the future. No doubt that low starting costs are attractive and are the reason for a widespread SaaS adoption. According to Columbus (2014), there were 69% of establishments running cloud-based solutions in 2014, compared to only 12% in 2012. However, it was noted by Forrest Burnson that over time, total system costs for both cloud-based and on-premises solutions tent to converge. The graph, showing the cost flow over a 10-year period is presented on figure 5.

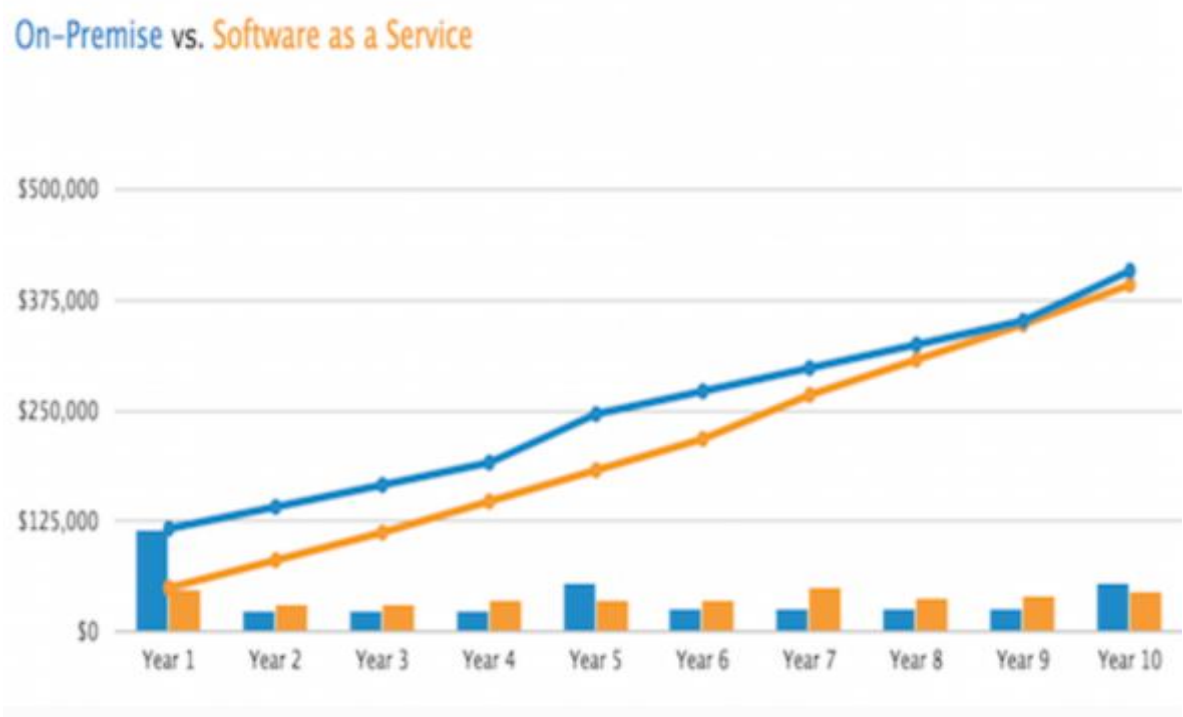


Figure 5 Total ownership costs for cloud and on-premises software

(Source: Software advice. Cloud vs. on-premises. Available at: http://www.softwareadvice.com/resources/cloud-erp-vs-on-premise/. (accessed: March 10, 2017))

Despite the fact that arguments above seem comprehensive, there are several more issues to consider, which are usually set aside, but play essential role. It is not totally correct to compare only subscription costs, since there are such issues as public utility payments arise. This item is usually forgotten to be calculated in the total usage costs. Generally, one server consumes from 500 to 1200 watt (Barett, 2016). The average price of electricity (kilowatt per hour – kw/hour) is around $0,133 (Energy Information Administration, 2016) in the USA, in Europe the average electricity price is €0,18 (Lamos, 2015), which is about $0,198 with average exchange rate in 2016 €1 = $1,1 (Investing.com. Accessed: 14.03.2017). In Russia it is about ₱3,2 (Fontanka, 2016), which is, with the average exchange rate ₱1 = $0,016 (Investing.com. Accessed: 14.03.2017), is around $0,051. A regular server 850 watt consumes in average 850watt * 24 hours *365 days / 1000 = 7446 kilowatt per year. This results in a following cost per year for each server: in the USA 7446 kw/year * $0,133 = $990,3; in Europe 7446 kw/year * $0,198 = $1474,3; In Russia 7446 kw/year * $0,051 =

$379,8. Additional costs for computer and mobile devices are not included, since they do not differ in any case of employment.

In case of cloud-based deployment, there are additional costs exist. Usually, SaaS providers do not set limits for the input data volume, meaning that users can upload as many information as needed. Although, there are usually limits set for the free output data: users can download only a particular amount of data. If there is a need in more data, vendors provide fees and data packages for such clients. For instance, Microsoft Azure allow for 5GB of free outbound, and charge any further GB in average for $0,12 (Microsoft Azure. Accessed: 14.03.2017). In case company uses, for example, 1TB per month, it would cost $120 more per month.

Considering all the stated above key points, there are 8 main features to examine:

1. focus on business features
2. previous experience
3. state of the IT resources and team
4. flexibility
5. security
6. implementation time
7. total cost of ownership vs total usage cost
8. payment options

One more characteristic to consider is portable device usage. Restaurant management requires controlled organisation. Usually, everyday activities tent to keep personnel under pressure. That is why every little feature that would help to ease the work is appreciated. Since mobile and hand devices in general have deeply entered people's lives, software vendors started provide solutions to integrate with mobile devices. This enables to serve clients faster and in a proper way. Such solutions save not only manpower, but also labour costs (Freed, 2007).

Whereas almost all full-service restaurant management information systems are multifunctional, there is one of forty (3%) information systems with only 1 function – kitchen management. The rest of systems are composed of four and more functions. From

40 full-service restaurant management information systems, all of information systems are constituted from the following functions in different combinations with other functions:

1. inventory management
2. kitchen management
3. wait staff management
4. Point-of-Sale (POS)
5. table management

One of the most important and most frequent functions is inventory management. This function enables managers to keep control over residuals, pull-dates, and usage. Inventory management feature shows alerts about replenishment dates and orders. Moreover, it helps to manage wastes.

Another vital function is kitchen management. The basic kitchen management solutions provide such features as orders scheduling, nutrition calculations and menu compilations. Although, there are add-ins exist, which enable to collaborate with inventory solution. For instance, with the help of inventory management restaurant may compose and promote dishes, which are made of fresh, but with close to issue date products, so to avoid waste costs.

The next function is wait staff management. It helps to keep track over personnel shifts, control time management and adjust a number of needed employees over peak and low times.

Point-of-Sale (POS) is a system, which enables for basic operational and monetary functions in the restaurant: order recording, bill preparation, check payments. It is actually a place, where all transactions are performed, despite the type of payment: cash or credit card. Some POS systems even allow to control inventory in a specific way: it can show the amount of dishes, which can be prepared with the resources left in inventory. What is special about this function, is that it can include CRM solution, such as loyalty program, in order to identify guests and provide them with personal benefits.

The table management function is a very useful one. This function is a basic for servers' operations. It shows the average time of turnover, which in general means the speed of service. Moreover, it shows the popularity of particular tables. What is more, it allows to compose different tables for special occasions for guests.

Despite of the basic functions, which are presented in full-set in all of the observed full-service restaurant management information systems, there are less frequent and even unique functions exist, provided by several software vendors. According to the comparison analysis, they are:

1. sales tracking
2. food costing
3. menu management
4. reservations management
5. payroll management
6. wait list management
7. self-service point
8. service area web-monitoring

The first observed function is sales tracking. With the help of it, managers can assess the most and least popular menu items, predict future demand, compose sets of dishes and so on. The right menu composition plays important role in boosting sales. 53% of vendors provide this as a basic function set.

50% of the examined software vendors do implement food costing. It is a function that enables to calculate cost of goods produced with respect to purchase, warehouse and usage costs. It usually shows the minimal acceptable price (MAP) for various menu dishes. What is more, this function shows nutrition values, which are important for balanced eating. This function is essential one, since pricing is one of the most vital elements, which should be controlled and managed wisely.

Menu management is also presented in 50% of analysed information systems. With this function it is possible to perform such actions, as: create menu, add a new menu item, change the order of items on the list, create blocks of items, relocate menu blocks. It is useful for

managers, since it allows to update menu frequently, offer seasoning dishes and adjust main menu items with ease and low time cots.

A little less frequently, 48% of vendors, do provide reservation management function. This is useful for eating hall planning, reservations and performance planning.

Moving further to the less frequent features, 35% of examined software have payroll function, which is usually is correlating with wait staff management function. It helps to calculate tips, shift payments and salaries.

35% of solutions have wait list management function. With the help of it, front line managers can keep track of waiting list of guests and manage the queue. Some vendors provide an SMS notification that the table is ready and clients can enjoy their meal.

Only one software (R-Keeper) provides as a basic set with two more unique functions: self-service point and service area web-monitoring. The first one is actually not useful in full-service restaurants, where all tables are served with personnel. The latter function is connecting web-camera to the Point-of-Sale (POS) system in order to keep track of eating area. This is a special one function, but most of the times not useful, since restaurants have their own cameras installed inside the restaurant area.

The next characteristic of full-service restaurant management information systems is portable device access. Most of the full-service restaurant management information systems examined do provide access with tablets and smartphones. Most of Point-of-Sale (POS) functions, such as order management, can be performed with Android or iOS based devices. These solutions are integrated within local network with all the software package functions. Sales tracking, loyalty cards and reservations, for instance, are also imaged in the system.

Big Data analytics is the next characteristic, which is crucial to consider. Big Data in restaurant management is used in analytical purposes. Information system generates huge amounts of data, process it and store on servers. In order to anticipate demand, peak or low times and preferences, managers use Big Data, create reports and analyse them. It helps to guide future actions and be prepared for changes.

One more characteristic is hardware provision. Many software vendors do provide special equipment, which can be installed and employed simultaneously. For instance, QR or any other code identification scanner may be used with the loyalty programs in order to distinguish the client from the mass of people. Cash desks and POS monitors are also used in restaurants. Moreover, it is just convenient to use a packed solution with software and necessary hardware included.

The last identified characteristic is availability of training programs. Most of providers offer to go through the training procedure in order to use the equipment and software correctly, get to know the peculiarities and special features. Moreover, availability of such educational programs is important for positions, where turnover is relatively high, such as servers. Newcomers may adopt faster and work in a proper way with the systems. Most of software vendors provide training programs as an additional tool, which can be added to the main full-service restaurant management information system package. Usually, such educational trainings are presented in a form of instructions or video.

The comparison characteristics analysis showed that there are 6 differentiating characteristics. They are listed further:

1. supported operating system
2. the type of data storage
3. support for portable devices
4. analytical functions (Big Data)
5. peculiar features
6. staff training

The overall functionality of reviewed information systems can be divided into two parts: basic functional set, which is common for all information system providers and additional functions, which are useful, but less frequently presented. Moreover, there was one function identified, which can be considered as excessive. All in all, there are 13 functions:

1. food costing
2. inventory management
3. kitchen management

4. menu management
5. payroll management
6. point of sale (POS)
7. reservations management
8. sales tracking
9. table management
10. wait list management
11. wait staff management
12. self-service point
13. service area web-monitoring

3.3 Analysis of the interviews

In the previous section, comparative analysis was performed. The market was observed and there were 40 restaurant management systems identified, based on reviews and ratings. The analysis revealed main characteristics and functions to pay attention at. Hence, the questionnaire was prepared, based on the performed analysis. Interview was designed for those restaurants, who have already implemented full-service restaurant management information system and started to employ it. The main aim of the survey is to identify what are the significant criteria, which play role in the selection of full-service restaurant management information system. Interview consists of 20 questions of two types: open-ended and multiple choice questions. The questions in the survey are based on different full-service restaurant management information system characteristics. Moreover, some of them are also aimed at defining the reason of particular function significance. Table 1 presents the survey with questions and answers options.

Table 1 Interview for restaurant establishments

1. What is the name of the restaurant establishment?	
2. What full-service restaurant management information system is currently in use?	
3. What operation system is in use?	Windows Mac OS Linux Other:
4. How the data is stored?	Own servers Cloud
5. What factors influenced current data storage method selection? Please, specify.	

6. Do you trust the data protection to the third parties?	Yes, information system provider Yes, third party provider No
7. What data protection methods are used?	
8. How many employees utilise full-service restaurant management information system?	
9. Do you employ IT specialist on a permanent basis?	
10. Who was responsible for full-service restaurant management information system selection?	
11. What factors influenced the selection of full-service restaurant management information system the most?	
12. Were any specific trainings performed?	Yes, by information system provider Yes, third party organisation No
13. What portable devices employees use to perform during working process?	Don't use portable devices Smartphones Tablets Notebooks Other:

14. Are there any analytical functions that are in use? (If no, how would you use them?) Please, specify any answer.	Yes, these functions are used: No, but would be useful:
15. How important is the cost of full-service restaurant management information system?	Primary Important Important enough It does not matter Generally it is not a selection criterion
16. What payment method for restaurant management information system is more preferable for you?	Recurring payments One-time payment Other:
17. Is there user identification in current restaurant management information system?	Yes No
18. Are there distinguished access levels among employees, who currently use restaurant management information system?	Yes No
19. Are there categories of employees, who has no information access restrictions? If yes, please, specify.	Yes: No
20. Please, mark the factors, which are considered significant in selecting restaurant management information system.	Supported operating system The type of data storage

	Support for portable devices Analytical functions Staff training Other:

The interview sample consists of 5 restaurants, located in Saint Petersburg. Interviews were all conducted in the March 2017. Among those, who were participating in the survey, names of establishments are not disclosed due to the willingness of staying confidential. Thus, within the frames of current study, the respondents are named restaurant establishments A, B, C, D, E.

Restaurant establishment A is a medium-sized restaurant, located in the Moskovskii district. It specialises on the Italian cuisine and wine. It has no branches in either city. Restaurant utilises information system iiko for 1,5 years.

Restaurant establishment B is a small restaurant; it works for almost a year. It specialises on the homemade bread and baking. The main menu emphasis is put on beer. This restaurant employs R-Keeper information system.

Restaurant establishment C is a big restaurant in the centre of Saint Petersburg, which consists of three sections: café, restaurant and bar. It pays attention to the cuisine and has more, than 300 seats. Restaurant C employs Tyllipad XL information system for more than 4 years.

Restaurant establishment D is a medium-sized restaurant. It is located in the city centre in Saint Petersburg and it operates for more than 6 years. Restaurant mainly provides Japanese cuisine in its menu. Restaurant employs R-Keeper information system.

Restaurant establishment E is operating since 2012. It specialises on the Turkish cuisine. It is a medium-sized restaurant with more than 150 seats. Since the opening, restaurant employs Traktir information system.

Among the restaurant establishments, there are usually more than 10 people, who utilizes the information system. Only restaurant B has 6 information system users, since it is the smallest restaurant in the sample. Sometimes, the number of users exceeds the possible number of users from the basic set. It can be explained in a way that dependent upon the shifts, several servers use one login to enter the system. Only one restaurant C extended the number of users in the system by purchasing the extension package for the reason that it has different server zones inside and this would not be convenient to keep track in the system from three parts as a one.

Among all the interviewees, all 5 restaurant establishments replied that they do not have the IT specialist employed on a permanent basis and that all the software and hardware support services are performed with the help of information system vendors or the third-parties. Thus, it can be concluded that the use of external support is important for the restaurants.

4 respondents replied that the full-service restaurant management information system selection process was performed mainly either by personal research of restaurant owners or by considering experience of administrative managers and friends. IT specialists were not responsible for the information system selection process in either establishment. Main considerations were that restaurants in general need more or less similar functions from establishment to establishment. Moreover, restaurateurs usually purchase several add-ins in addition to the basic set of the software, or they may have the ability to choose between packaged ready solutions: minimum, medium and large sets. Since customisable functions are optional and are not necessarily employed by every restaurant establishment, the question remain open about the real necessity of the particular special functions. Among main functions, sales tracking, menu management and inventory management were considered as primary ones. 4 out of 5 restaurant establishments were to choose the information system from the base. Only one restaurant B was to deploy the information system from the previous users. Thus, they were not selecting the information system from

the beginning, but they are able to compare and analyse, what they would like to change in the future, referring to the full-service restaurant management information system.

Among the respondents, restaurant establishments B and D reported that "self-service point" and "service area web-monitoring" functions, which are considered to be included in the minimal package solution of R-Keeper, are not used by the restaurants. There are two reasons for that:

1. self-service point is not used in full-service restaurants, since these establishments do not imply guests' self-service;
2. usually, web-cameras already exist in the restaurants and there is a special infrastructure created for them. Thus, additional web-monitoring is not in use.

One more curious feature, is that none of the respondent restaurants deployed portable devices access. Despite the fact that smartphones and tablets usage may simplify and speed-up the service process, restauranteurs decided not to implement the use of portable devices on a permanent basis during work. This decision was mainly considered with the necessity to coordinate several more devices and implies costs to buy the licensed applications.

Considering the trainings provided, 3 out of 5 restaurant establishments, mainly C, D and E, were provided with the educational introduction obligatory. The majority of the software providers do provide trainings either free as a part of the purchase, or for additional payment, as a supplementary service. Thus, during the selection process, it is highly recommended to decide, whether it is the need in the trainings or not, so to consider options with education. In restaurant A, owners and managers were familiar with the installed full-service restaurant management information system, which is why there was no need in educational trainings. In case B, restaurateurs were self-learning with the help of experienced manager.

3 out of 5 restaurant establishments (A, D and E) responded that they use cloud solutions to store the data. For the 2 of those 3, mainly A and E, the reason why they implemented cloud system, was the lack of space. Servers need location to be stored and in many cases restaurants do not disposal enough space, since the place is limited. Moreover, restaurant E replied that they do not trust third parties to store data, but they could find no place to use on-premises based data storing. Restaurant D stated that cloud-based solution was more

convenient and faster to implement and they faced limited time frames. Restaurants B and C stated that they use on-premises solutions for data storage. Although, B replied that it would rather deploy cloud solution, since server consumes space and is seem to be expensive in terms of electricity bills. Restaurant C, in turn, is satisfied with on-premises solution, since they have enough space to store servers. Restaurants use various methods to secure data, such as firewalls and data encryption. Moreover, all of the restaurant establishments imply user identification, like passwords, to prevent the external access. Furthermore, all restaurants have differentiated access rights to the data, so that particular staff category have gateway only to the necessary information. What is more, such approach prevents internal security threats, which also may take place (Shah and Okeke, 2011). In all restaurants there are groups of people, who can have unrestricted access to any data, such restaurateurs and accountants. In any way, data access should be considered closely, since there is no unified standard.

Each interviewed restaurant establishment replied that they accumulate a great number of information. In order to process it, they use analytical tools in the information systems. These tools process data to create reports of different levels and make predictions. All of the interviewed stated that this function is important for them.

All the restaurant establishments interviewed reported that they consider a cost of information system as significant, but not as a primary one. Of course, costs planning is important, but establishments paid more attention at the functionality side of the information system. Considering payments, 3 out of 5 stated that recurring payments are more preferable for them, compared to one-time payments. In contrast, B uses on-premises deployment, but stated that would prefer pay-as-you-buy option. That is curious, since B has adopted the already existing servers and maybe at the moment considering full-service restaurant management information system investments to change or adjust the current information system.

The last interview question asked respondents to mark factors, which they consider significant, when selecting information system, as soon as they are already experienced in the information system usage. As with the time of usage experience, restaurant establishments have changed their minds. Most of the opinions were adjusted, since none of

the respondents were to consider, for instance, deployment base initially as one of the main selection criterion. Generally, all the listed characteristics were mentioned at least once.

To sum up, all the restaurant establishments stated that they did not use help from IT specialists, when information system selection process was initiated. Despite that fact, they were searching for support services available in Saint Petersburg. Presumably, that is the reason why only Russian full-service restaurant management information systems were considered. With time, experience and after the interview, restaurateurs noticed that their initial selection criteria were adjusted.

3.4 Summary

In this chapter business research methods were described and used. For the purposes of business research, content analysis and interview were performed.

Firstly, 40 different full-service restaurant management information systems were reviewed. As a result, a comparison table was created. This helped to identify main characteristics of information systems. Among them: operating platform, deployment method, particular features, Big Data analytics and education programs availability. Every characteristic was described and analysed in terms of functionality, options, peculiarities and abilities.

Based on the performed analysis, interview questionnaire was created. It aimed at restaurateurs and managers, who laboured in a restaurant industry. The requirements for interview were as follows: an interviewee should have been involved in a decision-making process and establishment should have already implemented full-service restaurant management information system. The aim of the survey was to identify experts' opinion about main selection criteria. Before the survey, interviewees stated how they selected to deploy particular information system and which characteristics were considered as most significant. There were 5 interviews conducted. After the interview respondents adjusted their initial opinions about features and, in general, each selection characteristic was mentioned at least once as an important one. As a result, crucial and popular selection criteria were analytical function and the type of data storage.

4 DEVELOPMENT OF FULL-SERVICE RESTAURANT MANAGEMENT INFORMATION SYSTEM SELECTION MODEL

4.1 Full-service restaurant management information system selection model

The full-service restaurant management information system selection model is a tool that aimed at assisting restaurant establishment representative or responsible people in the selection process to choose from a vast amount of market offerings the one, which would suit best the particular needs and requirements. The offered model is going to guide a decision-maker through functional sets and help to choose characteristics of full-service restaurant management information system, which are most suitable for specified purposes and needs. It was noted already that it is a complicated task to choose among the number of characteristics those, which in reality would be useful, especially without special IT background and experience. There are many peculiarities exist, and the proposing model will address and tackle them, so to avoid decision-makers from problem-solving.

For restaurant managers the proposed model will appeared as a sequence of questions to answer. As a result, a list of necessary full-service restaurant management information system functions will be presented. From the technical side, the model is a 3-phase flow chart, which includes examined characteristics and combinations of possible options that are considered to be necessary, according to the answers. The stages of selection model are presented on figure 6.

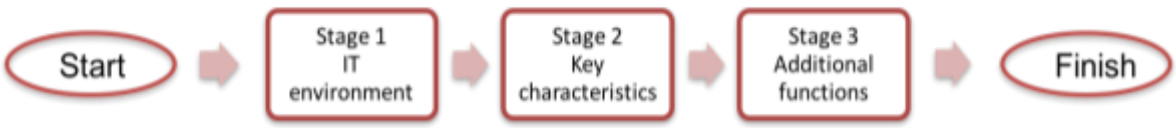


Figure 6 Full-service restaurant management information system selection model by stages (composed by the author)

The full flow chart selection model consists of 3 stages. Stage 1 explains information technology environment, which is one of the important questions – the type of data storage

deployment, which will further affect the information system selection process and restaurant establishment. Stage 2 is aimed at identifying the necessary combination of main characteristics of information systems. Stage 3 is defining a set of additional functions.

Moving on to the detailed model definition, there are 13 characteristics identified. Some of them may appeared to have several options to choose from. Characteristics are: supported operating system, the type of data storage, support for portable devices, analytical functions (Big Data), staff training. Moreover, there are additional functions of full-service restaurant management information systems exist: sales tracking, food costing, menu management, reservations management, payroll management, wait list management, self-service point, service area web-monitoring. Supporting operating systems has 6 possible options, which will be considered closely later. The next is the type of data storage, and there are 3 options. The following characteristics have only 2 options of presence or absence. Presumably, there are more than 50 000 different lists of combinations of full-service restaurant management information systems characteristics.

As it can be gathered, there is a huge massive of data, which can hardly be presented visually. That is why for the purposes of current study the part with additional functions will be presented separately. Moreover, it was decided to introduce the use of variables in order to narrow the flow chart model, so to avoid the branches repetition. As a result of flow chart full-service restaurant management information systems selection model, there will be a list of functions, which are dependent upon the answers. The created flow chart full-service restaurant management information systems selection model parts is presented in Appendix. Different stages of the model are separated and described in details further in current chapter.

4.1.1 Stage 1. IT environment

The first full-service restaurant management information system characteristic to consider is the data storage deployment. There are two options: cloud-based and on-premises. However, there are two more issues to consider, when implementing on-premises data storage deployment: on-premises deployment with and without service support. Hence, there are 3 options, among which can the choice be: cloud-based, on-premises with service support and on-premises without service support. In order to make a decision, firstly there is a need

to identify the path: cloud-based deployment or on-premises deployment. The next step in case of on-premises deployment is to choose between two alternatives on services support presence. In the previous chapter, there were 8 main features studied on the question of cloud-or-on-premises-deployment:

1. focus on business features
2. previous experience
3. state of the IT resources and team
4. flexibility
5. security
6. implementation time
7. total cost of ownership vs total usage cost
8. payment options

In order to continue the flow chart model algorithm, it is necessary to use only cut off factors, which give the possibility to definitely choose, which options to select. This requirement imposes exclusion of "flexibility" and "total cost of ownership vs total usage cost" features. Contemporary full-service restaurant management information systems are customizable despite the deployment base. The latter feature is rather ambiguous, since there is the question of what factors influence the investment decision. Among them the current state of IT resources and willingness to trust third parties. The remaining 6 features are included in the model. There is, although, an issue, which can cut off one from two options. Cloud-based deployment requires continuous and stable Internet connection in order to perform correctly. If there can be no reliable Internet connection, the only way to choose is the on-premises deployment. On the other hand, there is a need to store servers in case of on-premises deployment, hence if there is no room to locate servers, cloud-based deployment should be chosen instead. All in all, it is a decision-maker to decide.

Firstly, it is vital to identify, whether there are servers for use or not. The usual life-cycle of server is about 5 years of tough everyday employment (Olivieri, 2012). So, if the servers are outdated or soon will be, it is necessary to know, whether the establishment is going to replace them with the full-service restaurant management information system implementation decision.

Secondly, the point is about time implementation. As it was stated in previous chapter, the time needed to implement cloud-based solution is noticeably less than on-premises. It takes approximately a month or so to implement cloud services. On-premises requires respectively more time. Thus, if time frames are strict and tight, cloud-based solution would be more suitable, even without considering other factors. Figure 7 below represents a part of the full-service restaurant management information system selection model with servers and speed of implementation issues.

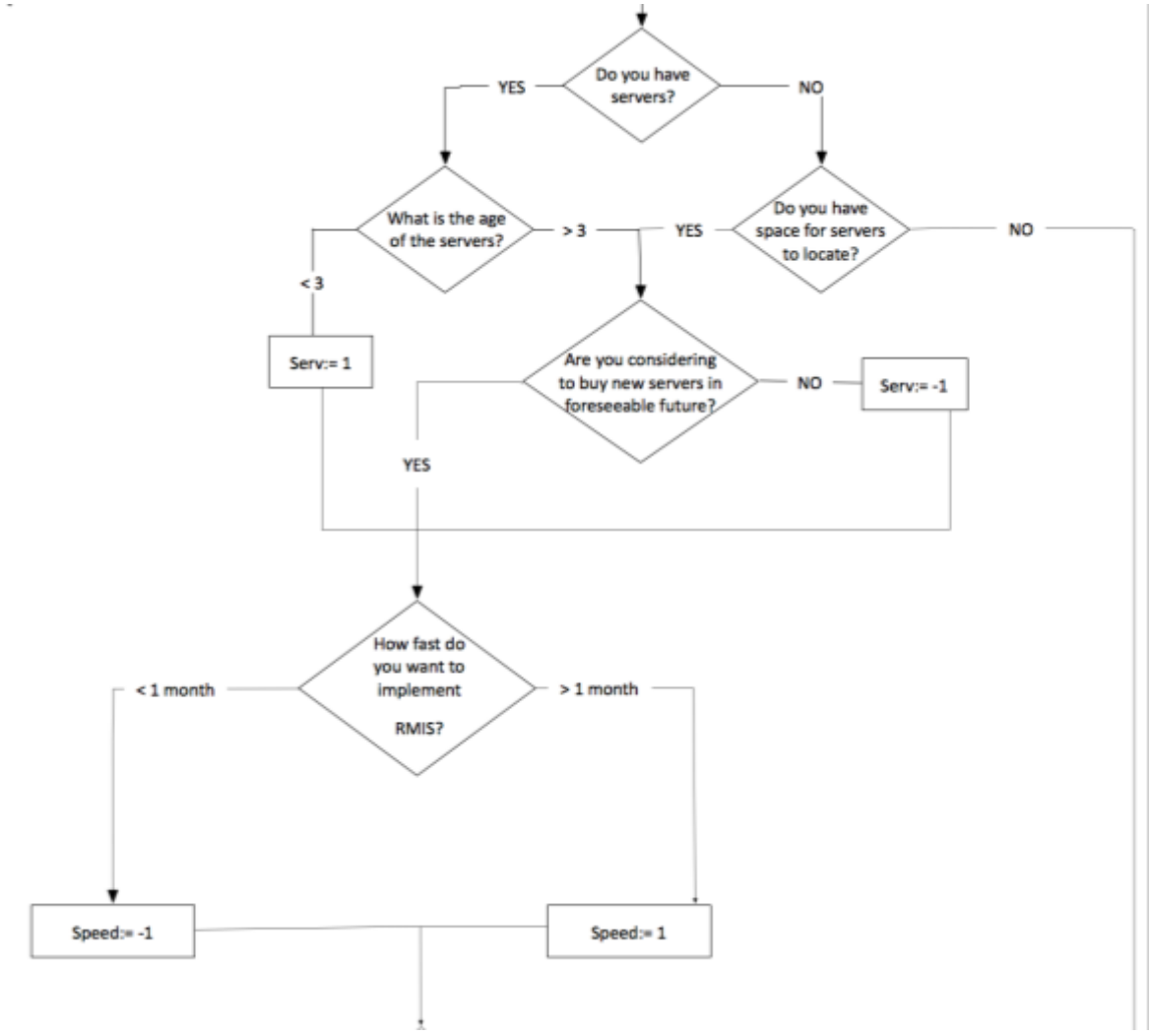


Figure 7 Servers availability and speed of implementation flow chart selection model parts (composed by the author)

Another vital issue is security of data. The security factor is rather subjective, since there is no one opinion over the question of what deployment type is more secure. Usually, it is about trust and experience.

Payment option is another important feature to consider. Since information system implementation is costly, this investment decision should be considered wisely, and the monetary factor usually influences the decision. When considering cloud-based solutions, there is usually a periodical payment system, which is a subscription fee. On the other hand, as software is considered as a product, on-premises solutions require not only hardware, but also licence purchase, which results in one-time payment for hardware and modular periodical less frequent payments for licensing.

Previous experience is a vital factor in decision-making. If the establishment has experienced a positive employment, presumably it will stick to the particular deployment type. Still, it is rather subjective decision, which is influenced by several more factors.

As there are so many factors to consider, sometimes decision-makers can face contradictions upon the significance of some features. For instance, if the time frames are tight, but the establishment wants to use own servers instead of cloud-based services, then it is crucial to rate the significance of the factors, since they lead to different deployment types.

Moreover, referring the on-premises deployment, it is sometimes important to consider the existence of IT-specialist(s) on a full basis, who are able to maintain full-service restaurant management information system and hardware. If there is such person exists, then it is considerable to implement on-premises deployment, since most of information systems vendors provide mostly remote control service.

All in all, there are 3 options to choose, considering deployment base: cloud-based, on-premises with service support and on-premises without service support. Figure 8 represents the deployment part. For detailed inspection of the flow chart model part with deployment base, see Appendix 1.

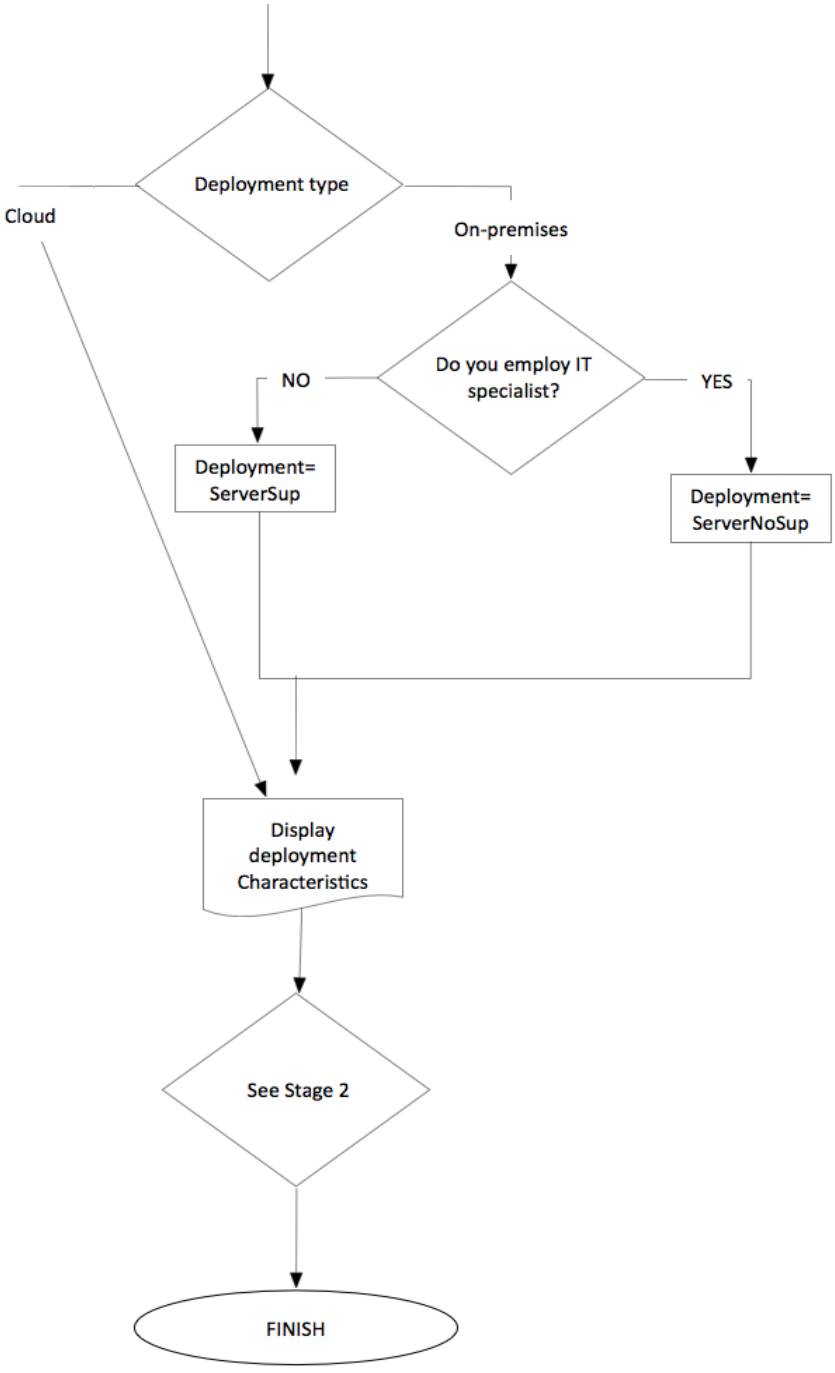


Figure 8 Deployment type part of flow chart selection model (composed by the author)

4.1.2 Stage 2. Key characteristics

The next considered characteristic is supported operating system. Operating system function has 3 main possible options to choose from, which are: Windows, Macintosh and Linux. But in contemporary world, sometimes users are appeared to employ more than one operating

system at a time. Thus, there appeared to be more two options, such as deploying several operating systems simultaneously on one computer and use different computers with different operating systems. The main reason why restaurant managers can decide to use several operating systems, is because different operating systems can provide different usage benefits. Thus, quick switching from one operating system to another may increase performance and enhance the usage quality (Hoffman, 2014). For some reasons, several information systems can work only on "older" operating systems and do not support, for instance, Macintosh OS, which imposes restrictions. In order to employ the newer software, another computer is needed. On the other hand, there are software, which are compatible with both operating systems, for instance, Windows and Macintosh. Hence, managers can employ one information system in two different computers at a time. Although, if software is supporting several operating systems and combination of operating systems is installed on one computer, for instance Windows and Macintosh, thus there is a need to choose the installation base. There are two things to keep in mind: which system is used most and whether Windows is installed or not. Full-service restaurant management information system will be used during everyday activities most of the day. And it is important to install the system on the main working devices. On the other hand, if Windows is already installed on the computer, it is much easier to employ it, since Windows is compatible with the most of information systems. Considering stated above arguments, there are 6 possible outcomes resulting in the first part of flow chart model. They are: Windows, Macintosh, Linux, Windows + Macintosh, Linux + Macintosh, Windows + Linux. The figure 9 represents the upper part of the described section in flow chart model.

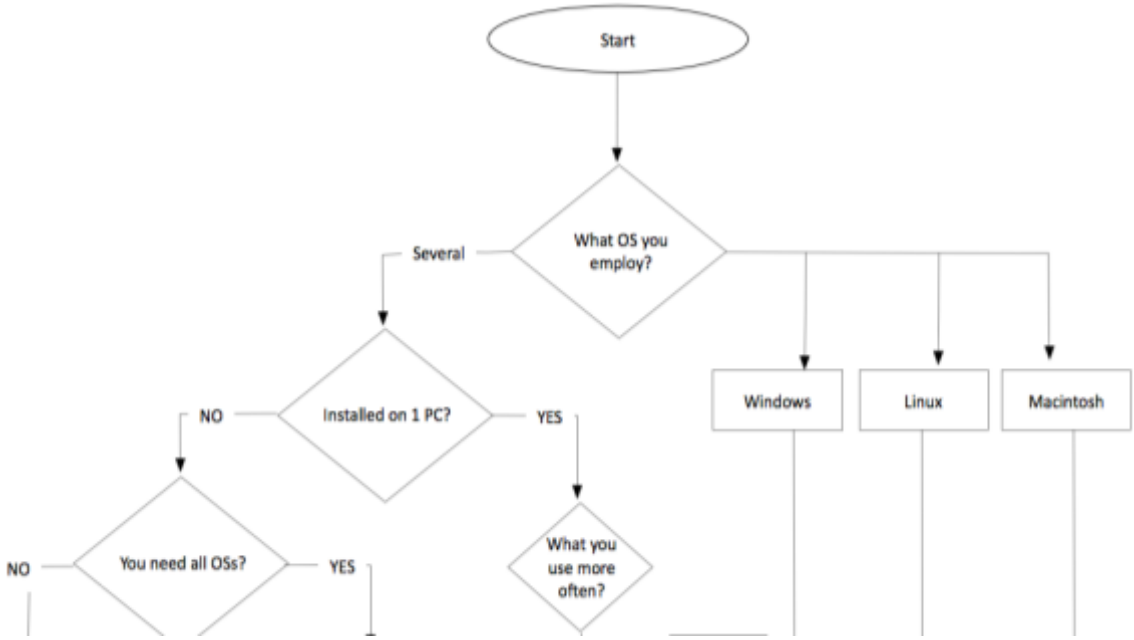


Figure 9 Full-service restaurant management information system selection model - operating system selection (composed by the author)

The further characteristic to consider is a portable device access. This option allows to reach the employed information system not only from computers in the office, but also from handheld device. With the help of this feature personnel can serve guests faster and minimize mistakes in orders to zero. For instance, traditionally, servers used to keep in mind or keep track on the paper about every order until they load the data into the system. With the number of orders made every day, the option to input the order data directly when it is performed can bring several benefits:

1. time gap between table order and further input into the system is lessen to zero;
2. number of mistakes made by servers is decreased;
3. if the menu item is out of serve, personnel can notice that immediately so that guests can choose to order something else.

Although, there are different types of restaurants exist and for small establishments it may seem inappropriate, since there is not huge guest flow during the day. The other point is in communication. Servers usually communicate with each other during the day, but they do not require special information system access to do so. According to the interview performed, respondents stated that they do not provide portable devices access, since mostly it is associated with additional costs and devices coordination. Due to this reason, portable devices access option is eliminated from further selection model creation.

Full-service restaurant management information systems have such function as Big Data analytics. Big Data is necessary to create reports and analyse internal information, to create predictions and estimations. Restaurant management information is heterogeneous: it may include sales reports, inventory data, details about suppliers, guests CRM and holidays data. This information can be presented in many ways: text, numbers, even pictures. That is why Big Data analytics is significant part to include in the full-service restaurant management information system. Statistics, which is gathered out of data can be useful for business process optimisation, decision-making and predictions. Usually, it is highly recommended to include Big Data analytics in the full-service restaurant management information system. Generally, there are two options in this section: to implement Big Data or not.

The last but not least characteristic of full-service restaurant management information system is training program. The majority of information system vendors provide educational trainings in different ways: some offer them as a part of basic pack, some may offer them for additional payment, some of providers do offer videos with usage explanations. Also there are system providers who do not provide trainings at all. These programs are necessary for those, who is not familiar with the information system. Although, if there is an experienced person in the restaurant, who can teach others, the need of training may disappear. Moreover, most of full-service restaurant management information system providers claim for friendly interface and usage experience. Thus, people can take little time to learn and adapt to the information system on their own. All in all, there are still two options considering training programs: to implement or not.

4.1.3 Stage 3. Additional functions

There are 8 more additional functions of full-service restaurant management information systems, for each of them there are two possible options: to implement or not to implement.

The first function is sales tracking. The primary goal of this function is to collect, store and report information about sales: least and most popular items ordered, predict future demands for menu dishes, create sets of dishes and so on. It is vital for the restaurant to keep track of sales since menu composition play important role in terms of profits. If the menu item is not

popular among guests, then it should be replaced with something new in order to attract attention. Big Data analysis can be performed on the basis of sales reports. For instance, the aggregated data, reported on different levels, allows to predict demands on a particular period of time.

The next function is food costing. This function enables to calculate cost of goods produced with respect to raw materials purchase, warehouse and usage costs. It usually shows the minimal acceptable price (MAP) for various menu dishes. What is more, this function shows nutrition values, which are important for balanced eating. This function is essential one, since pricing is one of the most vital elements, which should be controlled and managed wisely.

The next function to consider is menu management. With this function it is possible to perform such actions, as: create menu, add a new menu item, change the order of items on the list, create blocks of items, relocate menu blocks. It is useful for managers, since it allows to update menu frequently, offer seasoning dishes and adjust main menu items with ease and low time cots.

Reservations management is the next considered function. This is useful for eating hall planning, reservations and performance planning. Reservations management is especially useful at national holidays time, since many people prefer to celebrate special occasions in restaurants.

Next function is payroll management. It is closely connected with the wait staff management function and allows to calculate shifts, tips and salaries. Moreover, it helps to associate servers with bonuses and excess hours. It is important function in terms of workers' management, since the restaurant's performance highly depends upon service provided.

Wait list management is the next considered function. With the help of it, front line managers can keep track of waiting list of guests and manage the queue. Some vendors provide an SMS notification, when the table is ready and clients can come enjoy their meal. At most cases this function is not in use, since this practice of managing the queue from the restaurant's side and waiting for the table to be free from the guest's side is more applicable

to European approach. Only one Russian full-service restaurant management information system vendor provides this function – R-Keeper, which can be another justification of impracticality of this function. Thus, this function will be eliminated from the further research.

The two last functions are self-service point and service area web-monitoring. These functions in most cases are not applicable to the full-service restaurants and there are two reasons for that:

1. self-service point is not used in full-service restaurants, since these establishments do not imply guests' self-service;
2. usually, web-cameras already exist in the restaurants and there is a special infrastructure created for them. Thus, additional web-monitoring is not in use.

Due to the reasons, these two functions are eliminated from the further selection model development.

The second part of the full-service restaurant management information system selection model consists of 5 additional functions (the three two described functions are eliminated due to the inapplicability on Russian market). These are: sales tracking, food costing, menu management, reservations management and payroll management. Each of the functions have to options: either to be implemented or not.

As a result, the restaurant establishment receives a list of recommended information system features from 4 major characteristics: supported operating system, the type of data storage, analytical functions (Big Data) and staff training; and 5 additional functions: sales tracking, food costing, menu management, reservations management and payroll management. Figure 10 represents the respective part of full-service restaurant management selection model part.

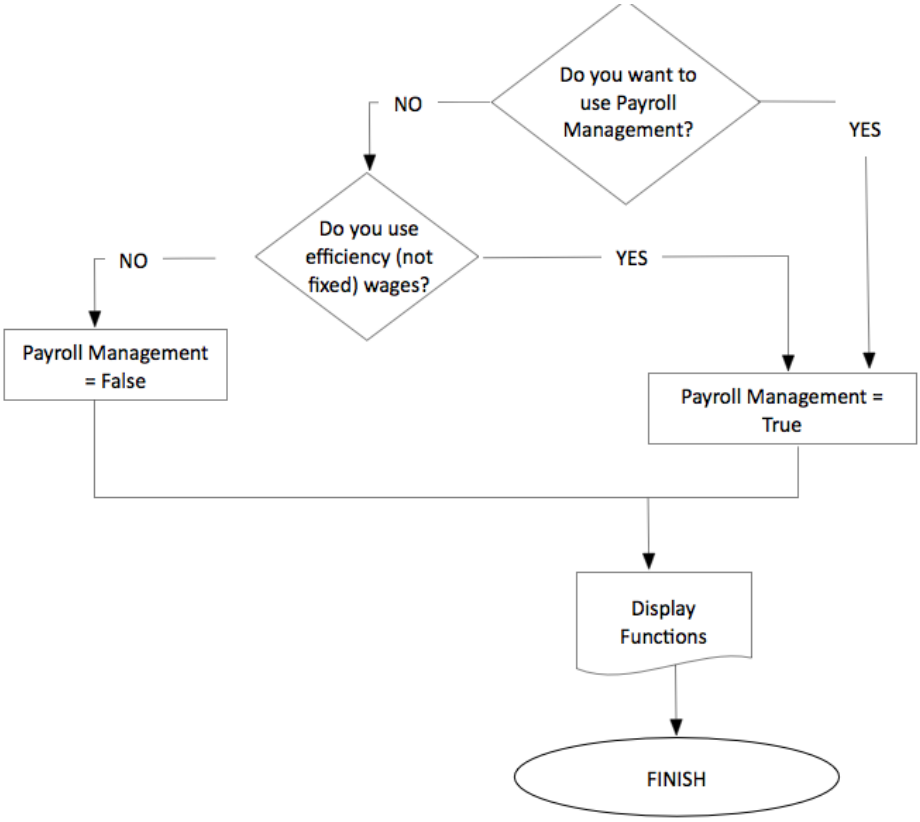


Figure 10 Full-service restaurant management information system selection model – additional functions display (composed by the author)

4.2 Managerial implications of main findings

The results of current study are applicable to restaurant establishments in several ways. This model is suggested to be used by both experienced establishments and those, who lack experience in the full-service restaurant management information system selection issue.

Firstly, performed interview could be cognitive for unexperienced establishments to assess their approaches and knowledge in the question of selection criteria and compare their opinions with experienced in the field establishments. Newly established restaurants' decision-makers can create their own list of selection criteria and then compare it to the results of the interview. There are two options: if the lists are similar, then the establishment can take into account and rely on the initial opinion. However, the designed model suggests several peculiar options and it is recommended to use it as well. On the other hand, if the lists will differ, then it is highly recommended to use full-service restaurant management information system selection model so to receive the list of recommended characteristics.

Secondly, unexperienced restaurant establishments can use the designed model to select its first restaurant management information system that will be suitable for the establishment's concept. The use of selection model will suggest recommendations about the 4 major characteristics, such as: supported operating system, the type of data storage, analytical functions (Big Data) and staff training; and 5 additional functions: sales tracking, food costing, menu management, reservations management and payroll management. As a result, restaurant establishment will be able to choose full-service restaurant management information system that supports resulted features.

Thirdly, considering experience establishments, they can use proposed full-service restaurant management information system selection model in two ways.

1. Restaurant establishment can verify the appropriateness of deployed information system with respect to the initial choice. It should answer selection model questions as they were considered before the implementation of particular full-service restaurant management information system. After performing all the stages, restaurant establishment will receive a list with recommended features of

information system. Then it can be compared with those characteristics, which are implemented currently in initial information system.

2. Full-service restaurant management information system selection model can be used by restaurant establishment in order to choose and implement new information system, if the restaurant establishment is not satisfied with employed restaurant management information system.

Moreover, analysis of 40 existing restaurant management information systems, performed in a form of a table, can be used by restaurant establishments as well. Restaurant establishment can use this table together with the list of recommended characteristics in order to assess options and choose the restaurant management information system to be implemented. Moreover, this table can be used to become generally informed about what features restaurant management information systems are inherent with.

4.3 Limitations and validations

The developed restaurant management information system selection model is suitable for the following categories of restaurants:

- full-service medium-priced and already existing restaurants;
- full-service medium-priced newly opened restaurants;
- full-service medium-priced restaurants, planning to be opened soon.

Self-service, fast-food and chain restaurants were not considered within the current study research, because they require extended and peculiar sets of additional functions, which are useless and excessive for the stand alone restaurant establishments. For instance, such functions as kitchen equipment management and control and self-service points are over excessive for single restaurant establishment. Moreover, franchising restaurants were as well excluded from the research, since at most cases they do not perform restaurant management information system selection process due to the fact that they employ suggested by franchisor information system (Ross, 2009). The reasons for that is the integration easiness between locations.

For the purposes of current study, single restaurants were considered in order to narrow the research and emphasise focus on the particular field.

4.4 Summary

Current chapter is dedicated to the creation of restaurant management information system selection model for restaurant establishments. This model is aimed at full-service medium-priced and already existing restaurants. What is more, developed model is useful and suitable for newly opened establishments or for those, who are only planning to be opened and wish to consider the issue of information system implementation in advance.

The model was created to assist in restaurant management information system selection process for restaurant establishments. The model requires to answer all questions to receive appropriate results. There are easy-to-understand questions, which address the issues about characteristics and features, which inherent in information systems. As a result, restaurant establishment receives the list with recommended functions to be implemented in the restaurant management information system.

The selection model is based on two parts: comparison analysis of 40 existing restaurant management information systems and performed interview with 5 restaurant establishment representatives, who were involved in decision-making process. There were initially 13 characteristics, but 3 were eliminated from the further model creation. In all, the model is constituted of 4 major characteristics: supported operating system, the type of data storage, analytical functions (Big Data) and staff training; and 5 additional functions: sales tracking, food costing, menu management, reservations management and payroll management.

The model is designed in such a way, to be understandable and easy to use for those, who have no IT background or technical experience. The perform of the selection model does not require any deep and special understanding of the restaurant management information systems. The full representation of restaurant management information system selection model parts is presented in Appendix.

5 DISCUSSION

Information technologies implementation allow to drive business activity and enhance operational performance of establishment in general. Information systems play significant role, because they enable users to perform regular tasks easier, diminish mistakes and faster service operations. Although, there is an issue with selection of information systems: only appropriately selected information systems can bring visible benefits. Thus, the problem of selection is significant and topical one.

Current research is based on the content analysis and interview. Content analysis is constituted of 40 existing full-service restaurant management information systems and is presented in a form of aggregated comparison table. Empirical research is an in-depth interview, conducted among 5 restaurateurs from Saint Petersburg, who were involved in full-service restaurant management information system selection process and already have had experience in utilizing it.

The comparison table performed is aimed at distinguishing main characteristics and features of existing full-service restaurant management information systems. After analysis, there were 13 characteristics identified. Among them, there were 5 key characteristics defined:

- supported operating system
- the type of data storage
- support for portable devices
- analytical functions (Big Data)
- staff training.

Although, only 4 of them were further selected for the flow chart model construction, since support for portable devices function turned out to be useless for considered type of restaurants, according to the conducted interviews. This function provides benefits for servers mainly, but according to the respondents' replies, it is associated with additional costs for licensed application purchase and internal devices integration.

Moreover, there are 8 additional functions of full-service restaurant management information systems that were identified:

- sales tracking
- food costing
- menu management
- reservations management
- payroll management
- wait list management
- self-service point
- service area web-monitoring.

Among them only 5 remained for the flow chart selection model creation. Such functions as wait list management, self-service point and service area web-monitoring seemed improper for the implementation in full-service restaurants.

There were 5 in-depth interviews conducted with restaurateurs from Saint Petersburg, who were involved in selection process and have gained respective usage experience. The aim of interview was in identifying what are the significant criteria, which play role in the selection of full-service restaurant management information system. All the restaurant establishments stated that they did not use help from IT specialists, when information system selection process was initiated. Despite that fact, they were searching for support services available in Saint Petersburg. Presumably, that is the reason why only Russian full-service restaurant management information systems were considered. With time, experience and after the interview, restaurateurs noticed that their initial selection criteria were adjusted. Since each selection characteristic was mentioned at least once as an important one, all of them, except for portable devices access, were included in the model. As a result, crucial and popular selection criteria turned out to be analytical functions and the type of data storage.

Current study aims to introduce the defined tool in a form of flow chart selection model, so that to enable management adjudge about what information system should be implemented under current circumstances and needs of the restaurant establishment. Appropriately selected information system allows restaurant establishment to operate easier and better in terms of speed and service quality.

Created full-service restaurant management information system selection model is suitable only for the following restaurant types:

- full-service medium-priced and already existing restaurants;
- full-service medium-priced newly opened restaurants;
- full-service medium-priced restaurants, planning to be opened soon.

The model created should be expanded to chain restaurants and self-service establishments. Current model is not relevant for these restaurant types, since it implies the use of different functions. Proposed model can be a base for further research in the current field and similar methodology. Moreover, it is necessary to regularly update the model, because characteristics and functions may change with the time, as information technologies evolve and information systems vendors introduce new functions.

Furthermore, there can be more full-service restaurant management information systems observed in order to identify more functions, other than in the current study. For instance, there can be included restaurant establishments with customizable software solutions. The comparison can be performed on the variations among the information system functions implemented. What is more, foreign full-service restaurant management information systems can be observed in terms of prices, services, functions and support.

The last issue is that the full-service restaurant management information system selection process was performed only from the technical approach. There can be added another features, which may influence the choice: size of the establishment or number of restaurants, owned by one restaurateur, which are not joined into the chain.

6 CONCLUSION

Information technologies are developing very fast and have been already deeply involved in our lives. In business sphere, there are such industries, as insurance, healthcare and banking, which implement information systems in order to improve the performance. The restaurant industry is not an exception. Implementation of information systems allow establishments to perform regular tasks easier, diminish mistakes and faster service operations.

Restaurant establishments all over the world nowadays implementing contemporary information technologies. Such technologies are called full-service restaurant management information technologies. Many research was performed on the topic of implementation of information systems, and benefits, which restaurant establishment can obtain from full-service restaurant management information system implementation. However, since the quick development pace of both the full-service restaurant industry and information technologies, there is a challenge arises: how to choose appropriate full-service restaurant management information system? There is a gap in examining the preliminary, upon the implementation, stage – selection of appropriate information system.

The selection process issue becomes topical one, since restaurants gain popularity and become one of the main leisure activities for people, full-service restaurant industry is changing fast and information technologies develop rapidly. There is a big chance for restaurant establishment to choose inappropriate information system with excess or shortage of functions, which results in waste of resources and overall decrease in operational performance. Thus, it is necessary to choose carefully and attentively.

The purpose of the study is to fill the research gap and identify how should restaurant establishments select full-service restaurant management information system. The aim of current study is to introduce the defined tool in a form of flow chart selection model, so that to enable management adjudge about what information system should be implemented under current circumstances and needs of the restaurant establishment.

The research was based on comparison analysis of 40 existing full-service restaurant management information systems and 5 conducted interviews with experienced in

employment information systems restaurateurs. These observations, analysis and outcomes are presented in the part 3.

As a result, 3-phase full-service restaurant management information system selection model was created. Step-by-step selection model development process is presented in the part 4. Proposed model was created to assist in restaurant management information system selection process for restaurant establishments. The model is designed in such a way, to be understandable and easy to use for those, who have no IT background or technical experience. The perform of the selection model does not require any deep and special understanding of the restaurant management information systems. 13 full-service restaurant management information systems features were distinguished while the content analysis and 9 of them were further used in the flow chart selection model creation. The importance of characteristics used as selection criteria was defined and proved by experts' opinions of restaurant establishments, experienced in the employment of full-service restaurant management information systems.

LIST OF REFERENCES

1. Ackere, A.V., Delgado, C.A., Larsen, E.R. 2015. A queuing system with risk-averse customers: sensitivity analysis of performance. *Cellular Automata*, 49(2).
2. Adams, J., Khan, T.A., Raeside R. and White, D. 2007. *Research Methods for Graduate Business and Social Science Students*. Response Books. New Delhi.
3. Aljazzaf M.Z., Capretz M., Perry M., 2015. Trust-based Service-Oriented Architecture. *Journal of King Saud University – Computer and Information Science* 28 (4). Retrieved from Science Direct.
4. Ashouraie, M., Jafari Navimipour, N., 2015. Priority-based task scheduling on heterogeneous resources in the Expert Cloud. *Kybernetes* 44 (10), 1455–1471

   Available from: http://www.tomshardware.co.uk/answers/id-2192699/electricity-computer.html.
5. Aznoli F., Navimipour N.J., 2017. Cloud services recommendation: Reviewing the recent advances and suggesting the future research directions. *Journal of Network and Computer Applications* 77 (2017) 73-86.
6. Bamiah, M., Brohi, S., Chuprat, S., Ab Manan, J. and Berhad, M. 2012. A Study on Significance of Adopting Cloud Computing Paradigm in Healthcare Sector. Proceedings of 2012 International Conference on Cloud Computing, Technologies, Applications & Management.
7. Baxendale, G., 2015. How secure is secure? *ITNow*.
8. Berry, L., 2001. Improve service by acting small. *Managing Service Quality* 11 (2), 75–79
9. Bilgihan, A., Kwun, D. J., Okumus, F., Nusair, K. 2011. Information technology applications and competitive advantage in hotel companies. Journal of Hospitality and Tourism Technology. 2 (2).
10. Brooks S., 2016. Big Data today. *Restaurant Business*.
11. Buyya, R., Venugopal, S., Yeo, C.S., 2008. Market-oriented cloud computing: Vision, hype, and reality for delivering it services as computing utilities. In: Proceedings of the Paper Presented at the 10th IEEE International Conference on High Performance Computing and Communications.

12. Columbus, L., 2014. Cloud Computing Adoption Continues Accelerating In The Enterprise. *Forbes*, November 2014
13. Fangpei, N. 2011. Key Success Factors of Innovative Management in Catering Industry. *Actual Problems of Economics*, 126.
14. Folkestad, B. 2008. Analyzing Interview Data Possibilities and challenges. Working Paper 13, Unifob Global / University of Bergen.
15. Foster, I., Zhao, Y., Raicu, I., Lu, S., 2008. Cloud computing and grid computing 360-degree compared. Paper Presented at the Grid Computing Environments Workshop.
16. Freed, J.Q., 2007. Handhelds keep managers alerted. *Technology*, November 2007
17. Frumkin, P., 2002a. Operators turn to technology to feed customer-service demands. *Nation's Restaurant News* November 25 36(47).
18. Frumkin, P., 2002b. Operators say handheld systems provide benefits for wait staff, customers. *Nation's Restaurant News* November 18 36(46).
19. Full-service restaurant definition, 2007. North American Industry Classification System (NAICS).
20. Guo, G. 2015. Analysis on Nutrients Evaluation of Hotel Catering Dishes and Marketing Management. *Carpathian Journal of Food Science and Technology 7(3)*.
21. Hayes, J., 2002. Industry execs: best customer feedback info is 'real' thing. *Nation's Restaurant News* March 18, 36(11)
22. Hayes, R. H. and Wheelwright, S. C. 1984. Restoring Our Competitive Edge. John Wiley: London
23. Hoffman, C. 2014. Dual Booting Explained: How You Can Have Multiple Operating Systems on Your Computer. *HowToGeek*, April, 28. Available at: http://www.howtogeek.com/187789/dual-booting-explained-how-you-can-have- multiple-operating-systems-on-your-computer/ (accessed on April 12, 2017).
24. Investing.com. EUR-USD currency. Available at: https://m.ru.investing.com/currencies/eur-usd-historical-data. (accessed at: March 14, 2017)

25. Investing.com. USD-RUB currency. Available at: https://m.ru.investing.com/currencies/usd-rub-historical-data. (accessed at: March 14, 2017).
26. Jiang, J. 2014. How much electricity does my computer use? *Tom's Hardware*. Available at: http://www.tomshardware.co.uk/answers/id-2192699/electricity-computer.html (accessed on April 12, 2017).
27. Johnston, R. and Morris, B. 1987. Dealing with inherent variability: the difference between manufacturing and service. *International Journal of Operations and Production Management*: 7 (4).
28. Jones, P. 1993. A taxonomy of foodservice operations, Presented at 2nd CHME National Research Conference, Manchester Metropolitan University
29. Jones, P. 1996. Introduction to Hospitality Operations, Cassell: London, UK
30. Jones, P. and Huelin, A. 1990. Thinking about catering systems. *International Journal of Operations and Production Management*: 10 (8), 42–51
31. Jones, P. and Lockwood, A. .2000. Operating systems and products, In Brotherton, B. (Ed.), An Introduction to the UK Hospitality Industry, Butterworth Heinemann: Oxford, UK, 46–70
32. Kimes, S., Thompson, G., 2004. Restaurant revenue management at chevys: determining the best table Mix. *Decision Sciences* 35 (3), 371–392
33. Kooser A.C., 2013. Big Data arrives. *Restaurant business*, September 2013.
34. Koys, D., 2003. How the achievement of human-resources goals drives restaurant performance? *Cornell Hotel and Restaurant Administration Quarterly* 44 (1).
35. Lamos, E. 2015. Fondation EurActiv. Electricity prices in Europe. Available at: https://www.euractiv.com/section/electricity/video/electricity-prices-in-europe/. December 2015.
36. Liddle, A.J., 2001. Walking the point-of-sale tightrope protected by unconventional net. *Nation's Restaurant News* February 26, 35(9).
37. Liddle, A.J., 2002. NRA tech poll bolsters think-tank's 2010 forecast. *Nation's Restaurant News* November 26, 36(47).
38. Liddle, A.J., 2003. Using web for discounting clicks with digital diners. *Nation's Restaurant News*, May 2003.
39. Manvi, S.S., Shyam, G.K., 2014. Resource management for infrastructure as

a service (IaaS) in cloud computing: a survey. J. Netw. Comput. Appl. 41, 424–440.

40. Maras, E. 2016. Foodservice Operators Embrace Supply Chain Management software. *Sector Reports,* 9.
41. MARKET, L. (2015). Restaurants in Europe. Market Line Industry Profile.
42. Martinez J.D., 2014. Running with numbers. *New world*, August 2014.
43. Middleton, P., Kjeldsen, P. and Tully, J. 2013. Forecast: The Internet of Things, Worldwide. *Gartner, Inc*.
44. Milani, A.S., Navimipour, N.J., 2016a. Load balancing mechanisms and techniques in the cloud environments: systematic literature review and future trends. J. Netw. Comput. Appl. 64.
45. Milani, B.A., Navimipour, N.J., 2016b. A comprehensive review of the data replication techniques in the cloud environments: major trends and future directions. J. Netw. Comput. Appl. 64, 229–238.
46. Miles, M. B., Huberman, A. M. 1994. Qualitative Data Analysis: an Expanded Sourcebook. Thousand Oaks, California, Sage.
47. Nation's Restaurant News, 2003b. Red robin tackles food, labour costs. *Nation's Restaurant News*, October 2003.
48. Navimipour, N.J., 2015a. A formal approach for the specification and verification of a trustworthy human resource discovery mechanism in the expert cloud. Expert Syst. Appl. 42 (15), 6112–6131.
49. Navimipour, N.J., Rahmani, A.M., Navin, A.H., Hosseinzadeh, M., 2015. Expert cloud: a cloud-based framework to share the knowledge and skills of human resources. *Comput. Hum. Behav*. 46, 57–74.
50. Navimipour, N.J., Zareie, B., 2015. A model for assessing the impact of e-learning systems on employees' satisfaction. *Comput. Hum. Behav*. 53, 475–485.
51. Olivieri J. Hardware and software readiness: Asystems approach //Systems Conference (SysCon), 2012 IEEE International. – IEEE, 2012. – C. 1-6.
52. Owens, E., Baqir, N. 2014. The expert Opinion. *Journal of Global Information Technology Management* 17.
53. Papazoglou, M.P., Georgakopoulos, D. (Eds.), 2008. Service-Oriented Computing. The MIT Press, Cambridge, MA.

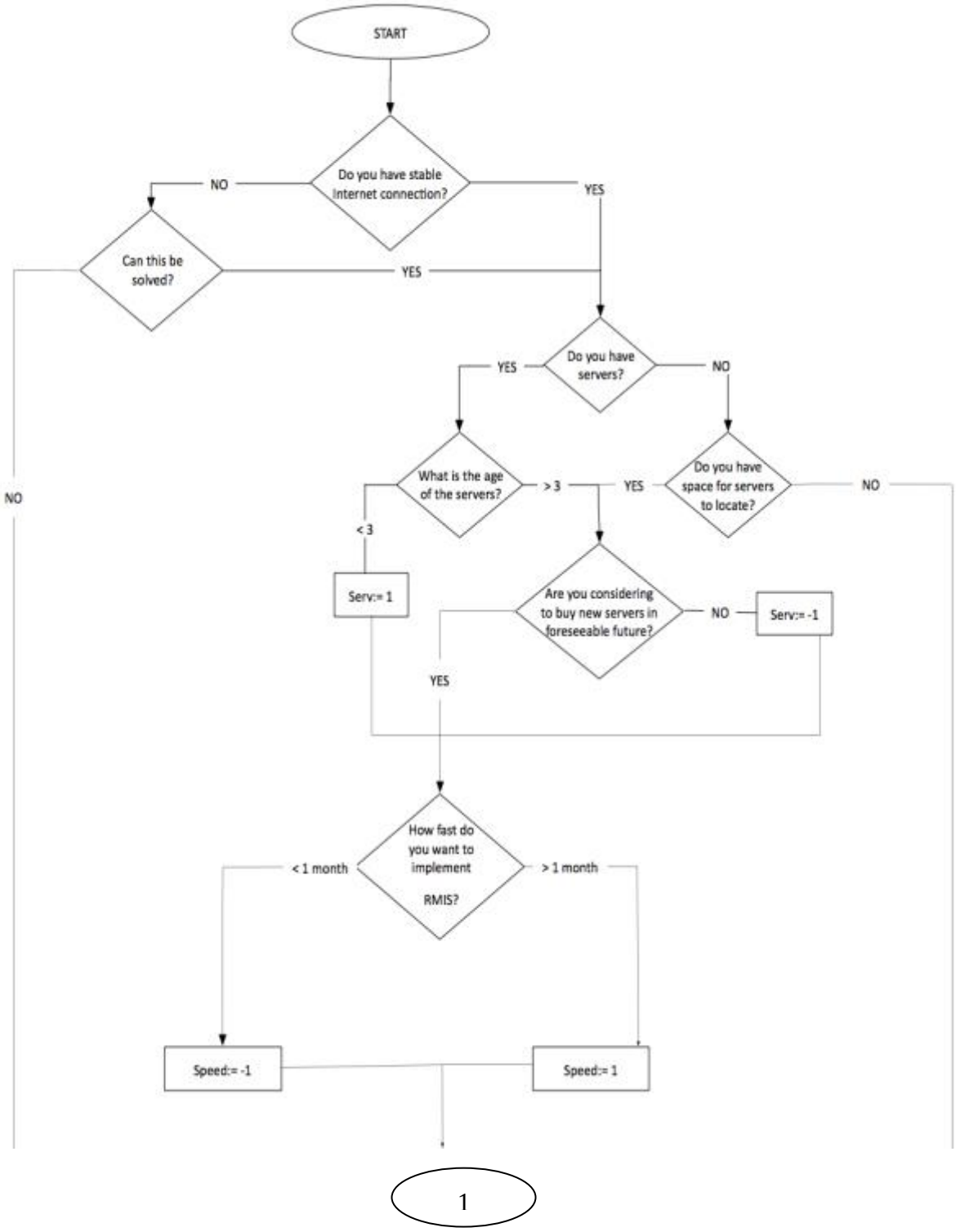
54. Patil, H. K. and Seshadri, R. 2014. Big data security and privacy issues in healthcare. Paper presented at 2014 IEEE International Congress on Big Data.
55. Porter, Michael E. 1985. *Competitive Advantage*. Ch. 1, pp 11-15. The Free Press. New York.
56. Prewitt, M., 1997. Turn customer data into marketing opportunities. *Nation's Restaurant News*, February 3
57. Prewitt, M., 2003. Wireless technology is the formula for better customer service. *Nation's Restaurant News*, November.
58. Price of One Kilowatt will rise up to 4 rubles in 2016. Fontanka. [In Russian]. Available at: http://www.fontanka.ru/2016/01/01/041/. (accessed at: March 14, 2017).
59. Pricing. Microsoft Azure website. [Electronic resource]. Available at: https://azure.microsoft.com/en-us/pricing/details/data-transfers/. (accessed at: March 14, 2017).
60. Quick Service Restaurant IT Market - U.S. Industry Analysis, Size, Share, Growth, Trends and Forecast 2016 – 2024. Available at: https://www.reportbuyer.com/product/4201048/quick-service-restaurant-it-market-u-s-industry-analysis-size-share-growth-trends-and-forecast-2016-2024.html. (accessed at: March 14, 2017).
61. Rajasekar, S., Philominathan, P., Chinnathambi, V. 2013. Research Methodology. Manuscript, October 2013
62. Ross, J.R., 2009. Tar Heel Capital's Ireland: Partnership sparks IT innovation. *National Restaurant News*. April 2009
63. Ruggless, R., 2003. Industry execs, educators seek ways to boost customer counts. *Nation's Restaurant News* December 15, 37(50) (obtained via ABI/Inform Global)
64. Shah, M., Okeke, R.I. 2011. A Framework for Internal Identity Theft Prevention in Retail Industry. Piscataway, NJ USA; Athens Greece: IEEE. pp. 366-71.
65. Software advice. Cloud vs. on-premises. Available at: http://www.softwareadvice.com/resources/cloud-erp-vs-on-premise/. (accessed: March 10, 2017).

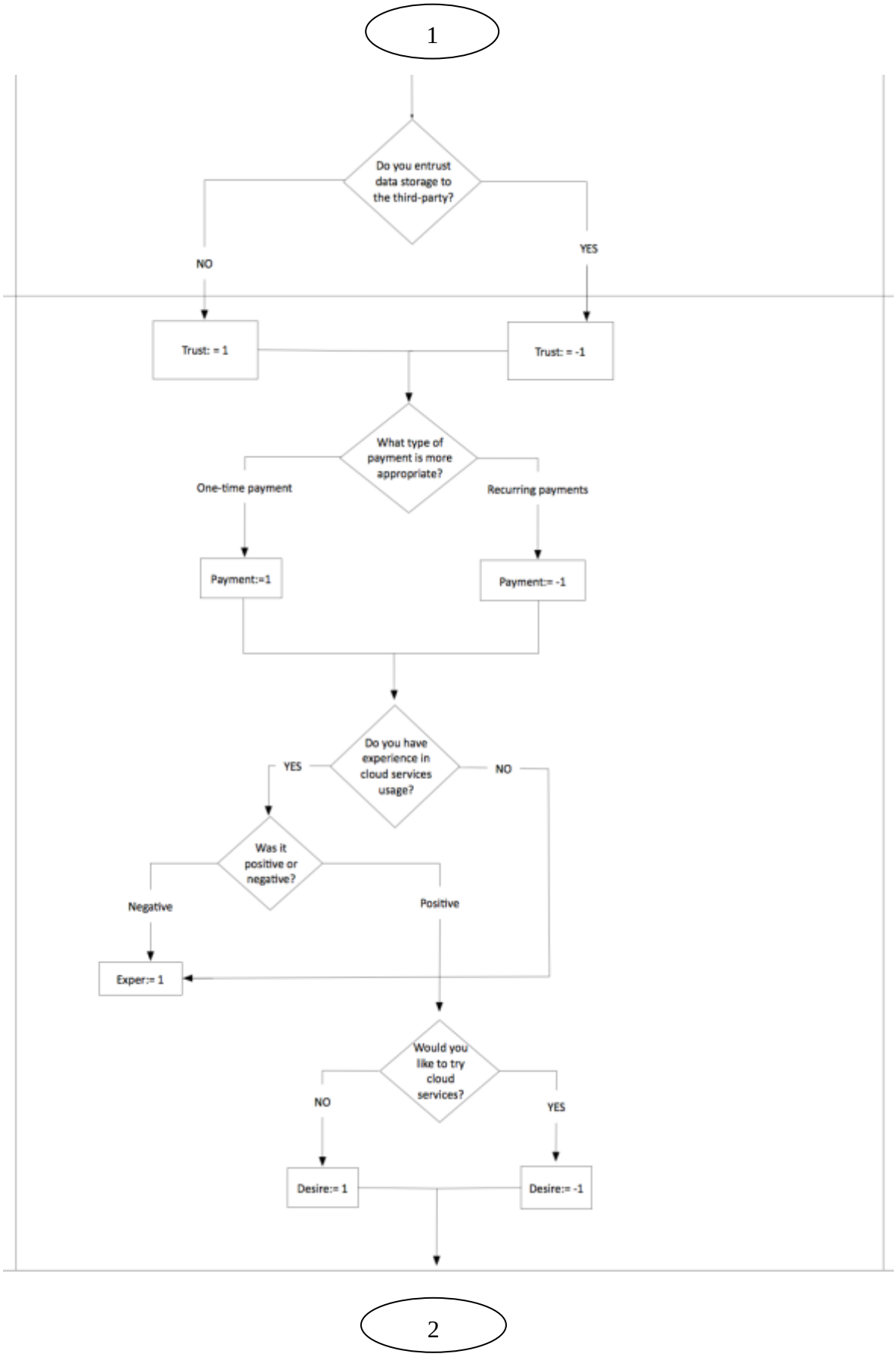
66. Susskind, A., Reynolds, D., Tsuchiya, E. 2004. An evaluation of guests' preferred incentives to shift time-variable demand in restaurants. *Cornell Hotel and Restaurant Administration Quarterly* 45 (1), 68–84
67. Taft, K. D. 2011. Moving to the Cloud: A 'Rational' Choice for McDonald's. *eWeek.com.* June 2011
68. The U.S. Energy Information Administration (EIA), 2016. Short-Term Energy and Summer Fuels Outlook.
69. World industry and market outlook, 2015. North American Industry Classification System (NAICS).
70. Xu, J., Ping, L., Shu-Qin and H. Yu. 2013. Development for rural E-government SaaS application. *Information Technology Journal*, 12.
71. Yan, L. 2014. Application and research of Six Sigma Management Method in Hotel Food Safety Control. *Carpathian Journal of Food Science and Technology*, 6 (2).
72. Zhu, Y. 2014. Construction of SaaS-based Restaurant Management System. *Information Technology Journal* 13(15).
73. Zimmerman, K. 2016. Hospitality business flat, but glimmers of hope are lurking. *Fairfield County Business Journal,* August 2016.
74. Zip Schedules. 7 Reasons Why Restaurant Management Software is So Important. Available at: http://zipschedules.com/?s=7+Reasons+Why+Restaurant+Management+Software+Is+So+Important. (accessed: March 10, 2017).

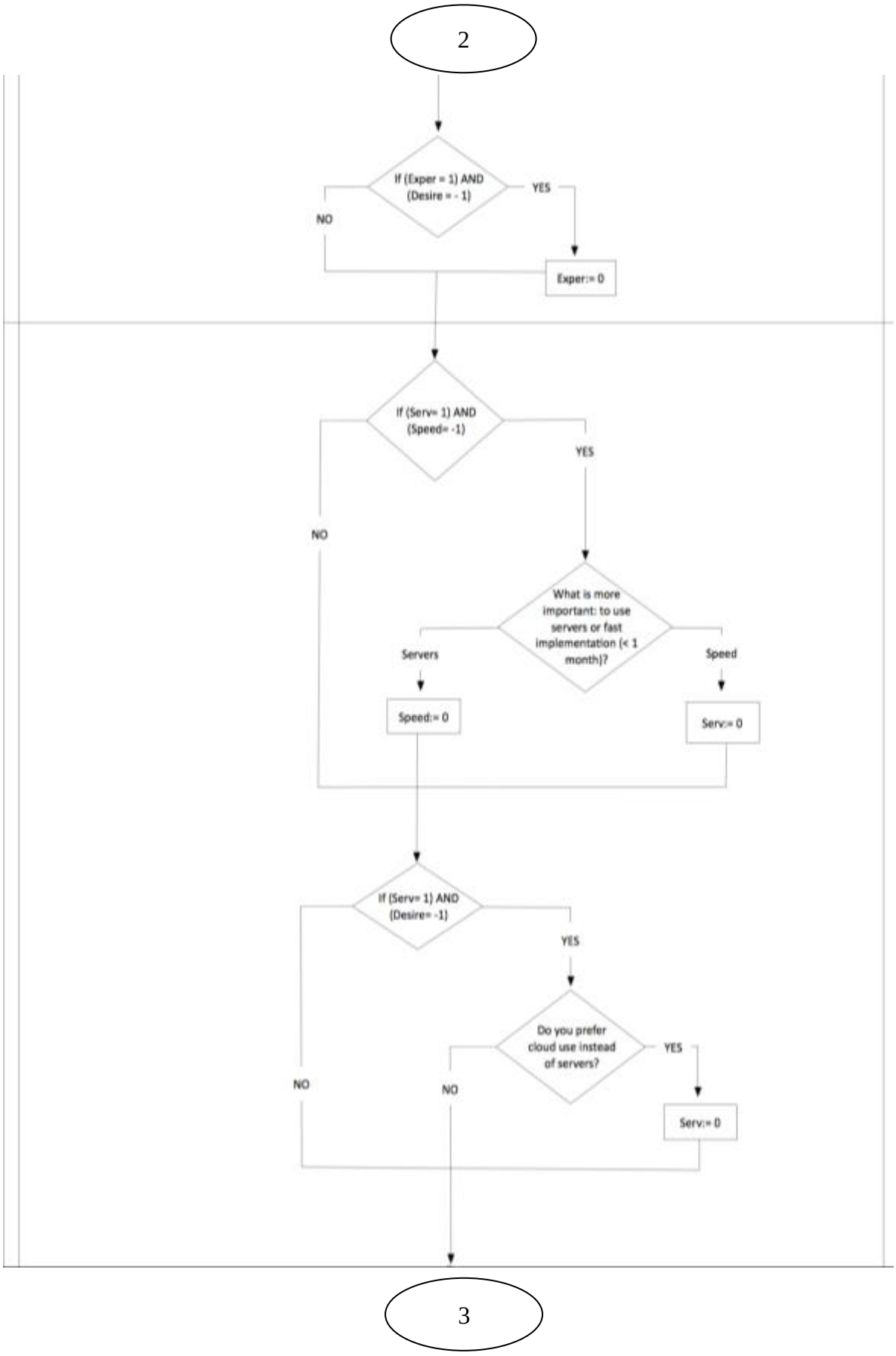
APPENDICES

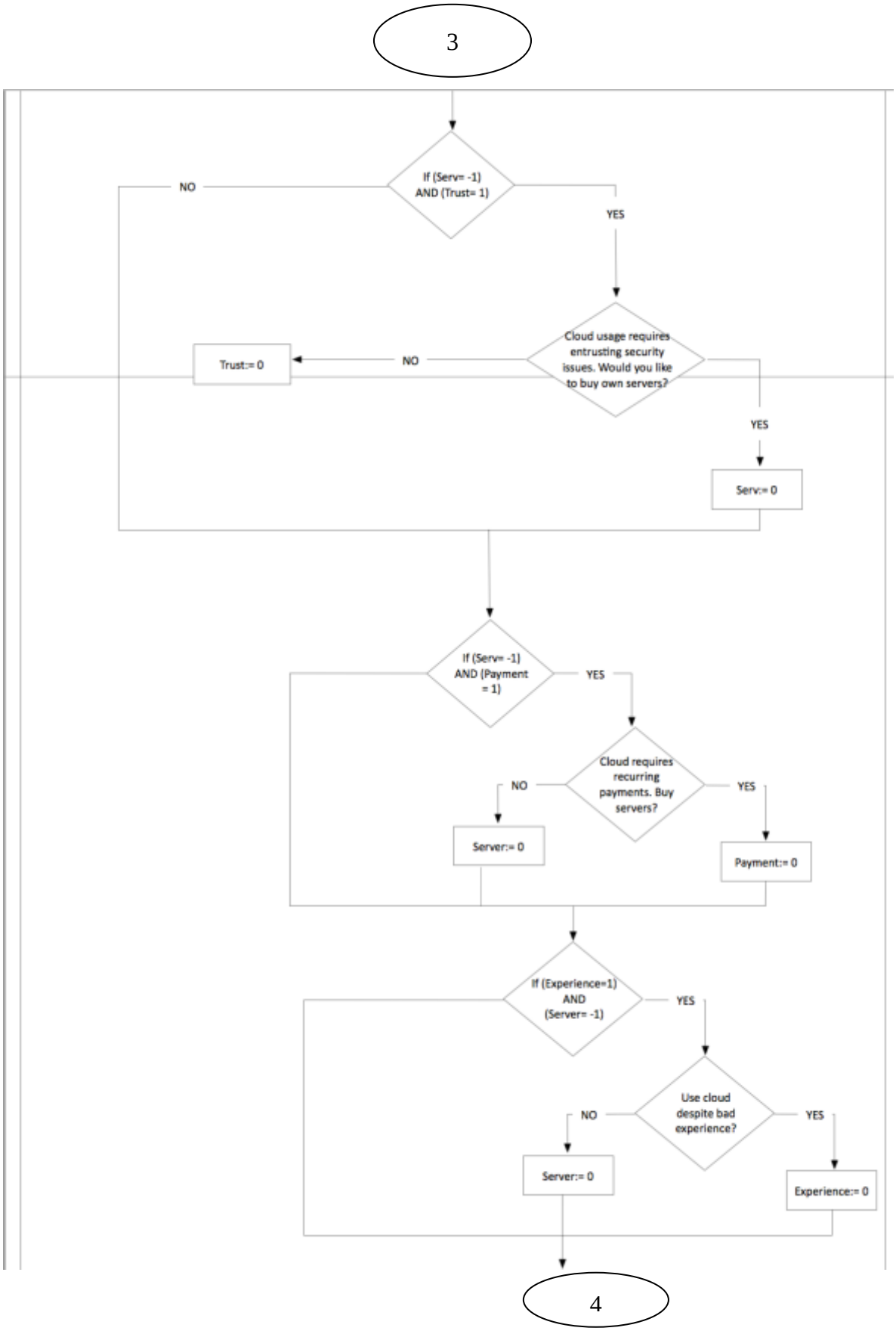
Appendix 1

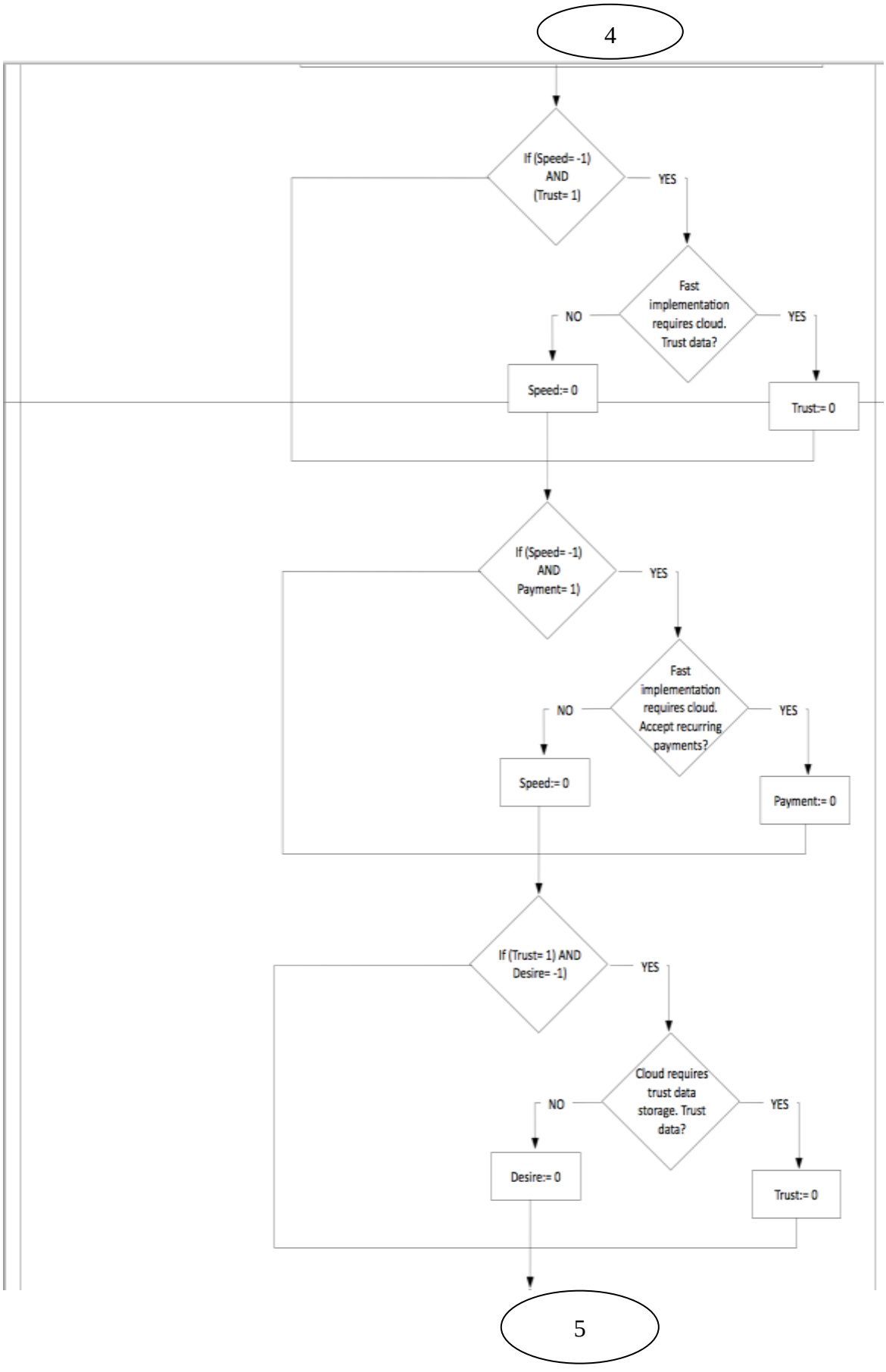
Stage 1. IT environment

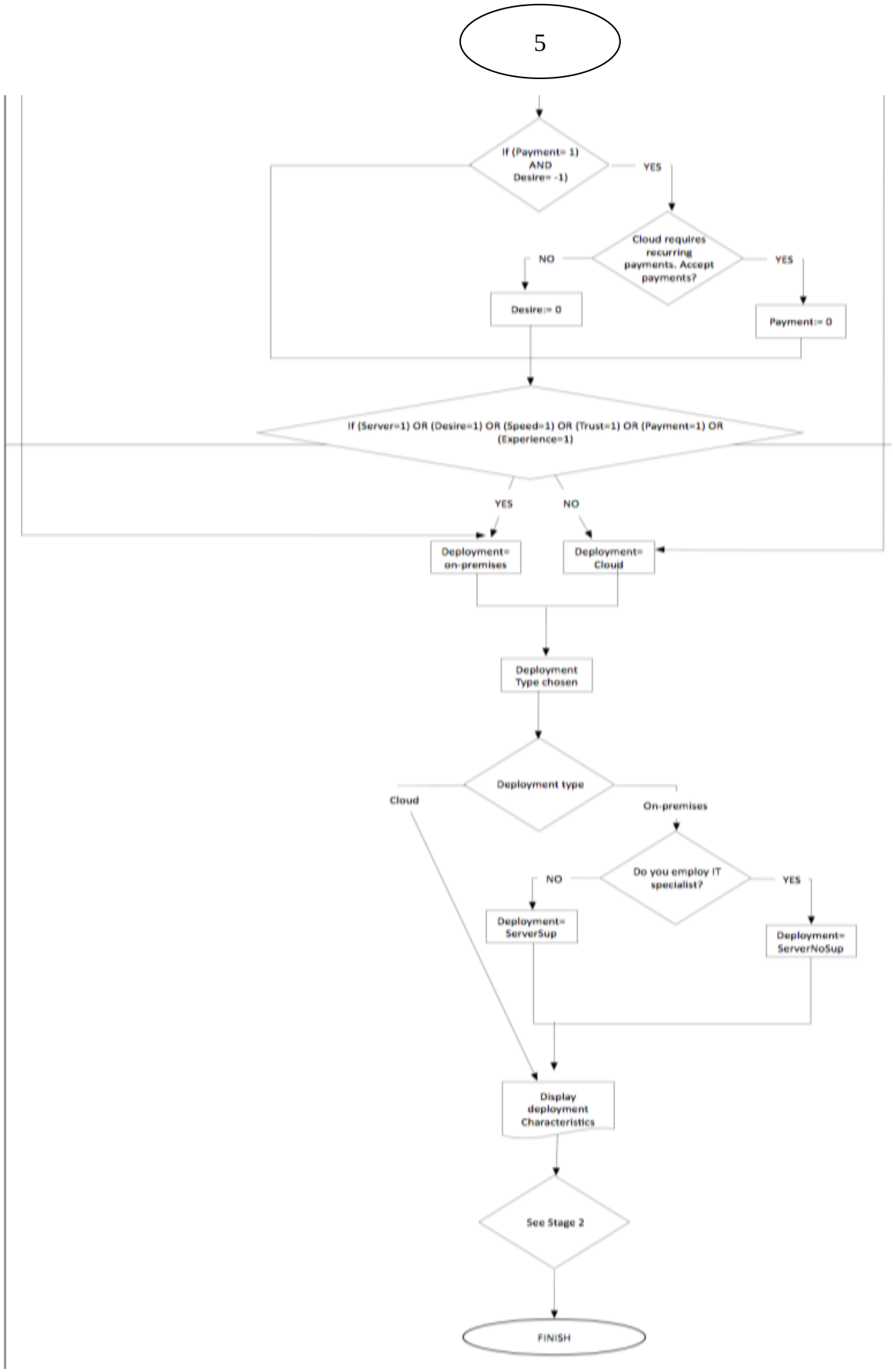



1
Do you entrust data storage to the third-party?
NO
YES
Trust: = 1
Trust: = -1
What type of payment is more appropriate?
One-time payment
Recurring payments
Payment:=1
Payment:= -1
Do you have experience in cloud services usage?
YES
NO
Was it positive or negative?
Negative
Positive
Exper:= 1
Would you like to try cloud services?
NO
YES
Desire:= 1
Desire:= -1
2


2
If (Exper = 1) AND (Desire = - 1)
YES
NO
Exper:= 0
If (Serv= 1) AND (Speed= -1)
YES
NO
What is more important: to use servers or fast implementation (< 1 month)?
Servers
Speed
Speed:= 0
Serv:= 0
If (Serv= 1) AND (Desire= -1)
YES
NO
Do you prefer cloud use instead of servers?
YES
NO
Serv:= 0
3

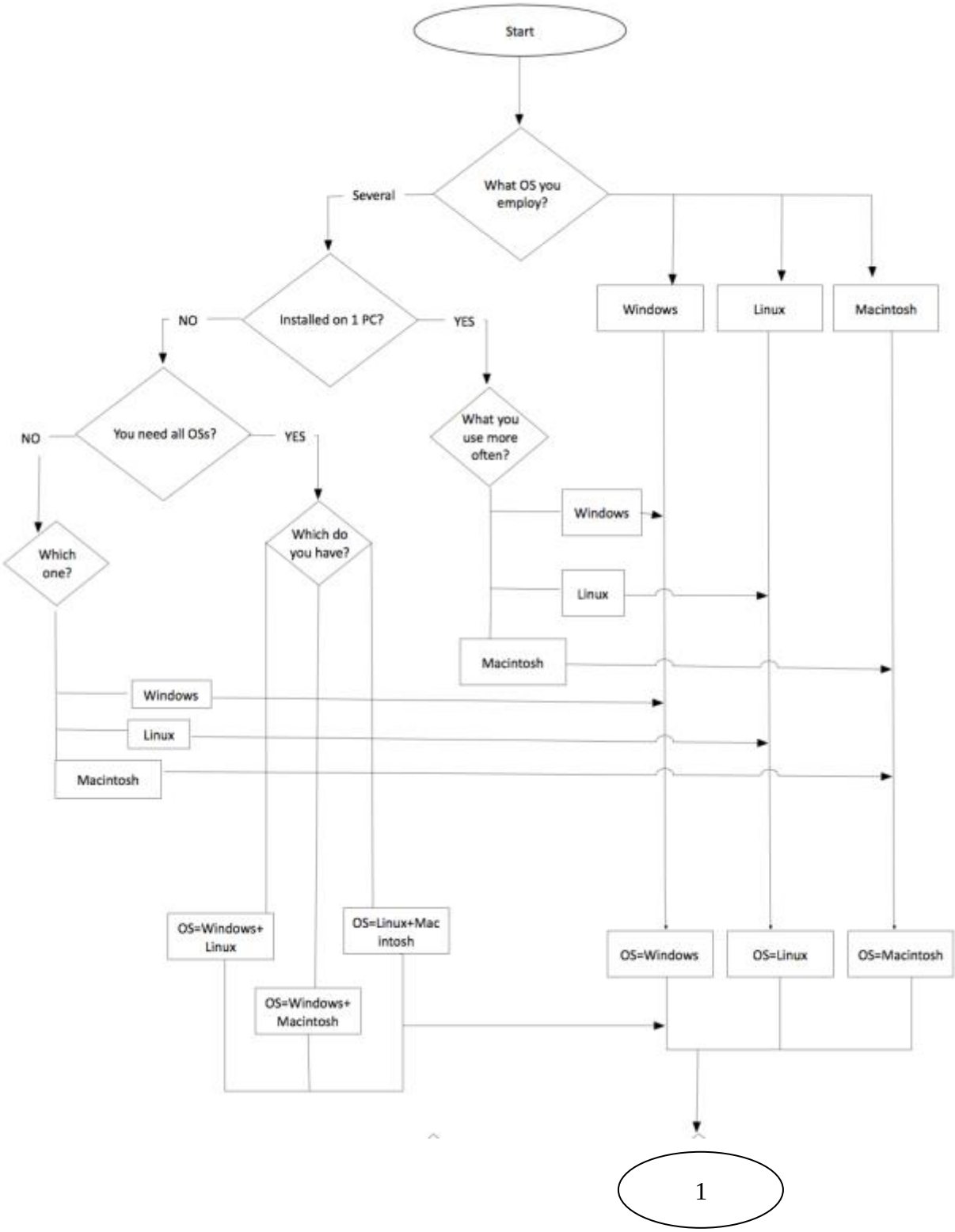

3
If (Serv= -1) AND (Trust= 1)
NO
YES
Cloud usage requires entrusting security issues. Would you like to buy own servers?
NO
Trust:= 0
YES
Serv:= 0
If (Serv= -1) AND (Payment = 1)
YES
Cloud requires recurring payments. Buy servers?
NO
YES
Server:= 0
Payment:= 0
If (Experience=1) AND (Server= -1)
YES
Use cloud despite bad experience?
NO
YES
Server:= 0
Experience:= 0
4

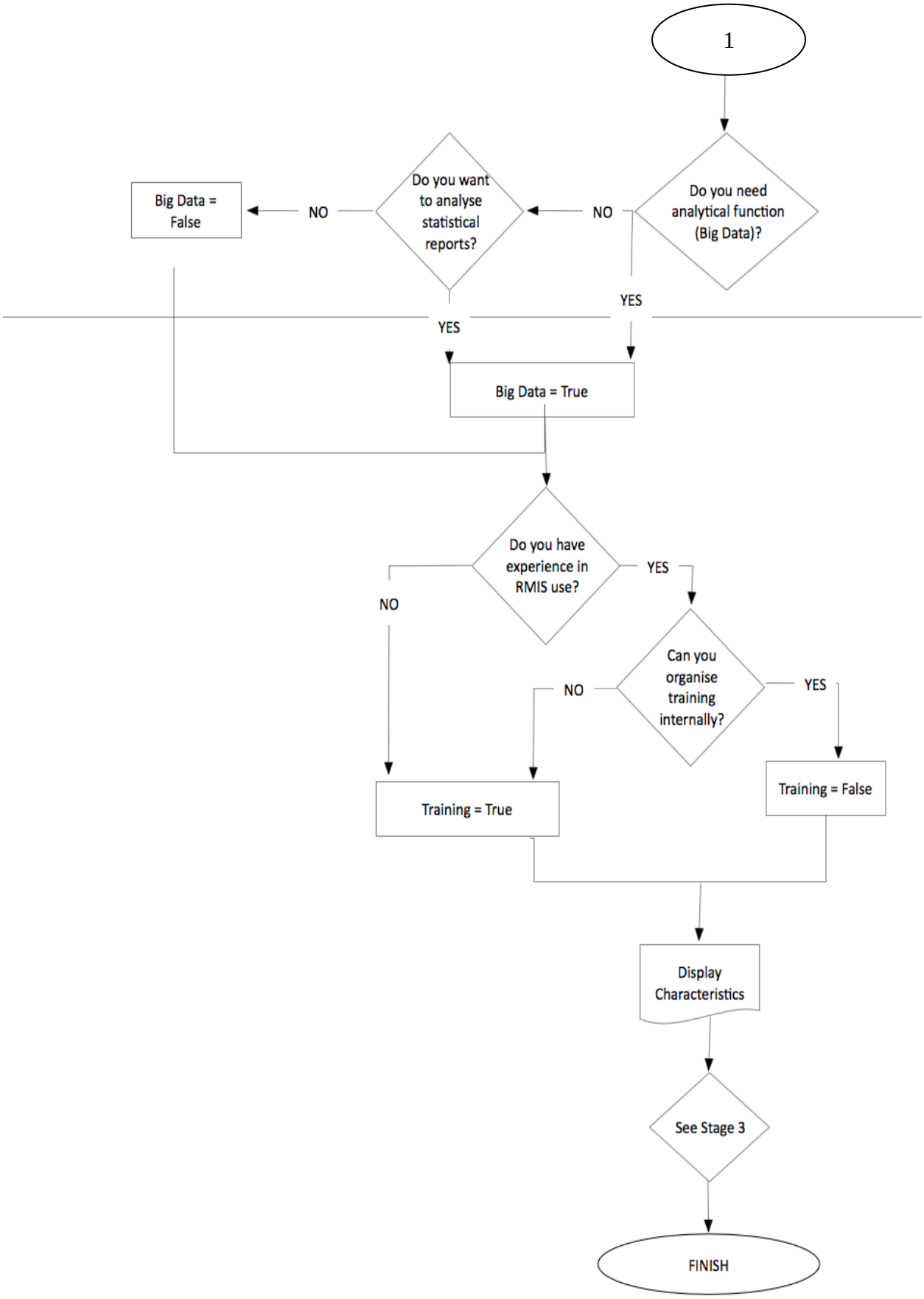

4
If (Speed= -1) AND (Trust= 1)
YES
Fast implementation requires cloud. Trust data?
NO
YES
Speed:= 0
Trust:= 0
If (Speed= -1) AND Payment= 1)
YES
Fast implementation requires cloud. Accept recurring payments?
NO
YES
Speed:= 0
Payment:= 0
If (Trust= 1) AND Desire= -1)
YES
Cloud requires trust data storage. Trust data?
NO
YES
Desire:= 0
Trust:= 0
5


5
If (Payment= 1) AND Desire= -1)
YES
Cloud requires recurring payments. Accept payments?
NO
YES
Desire:= 0
Payment:= 0
If (Server=1) OR (Desire=1) OR (Speed=1) OR (Trust=1) OR (Payment=1) OR (Experience=1)
YES
NO
Deployment= on-premises
Deployment= Cloud
Deployment Type chosen
Deployment type
Cloud
On-premises
Do you employ IT specialist?
NO
YES
Deployment= ServerSup
Deployment= ServerNoSup
Display deployment Characteristics
See Stage 2
FINISH

Appendix 2

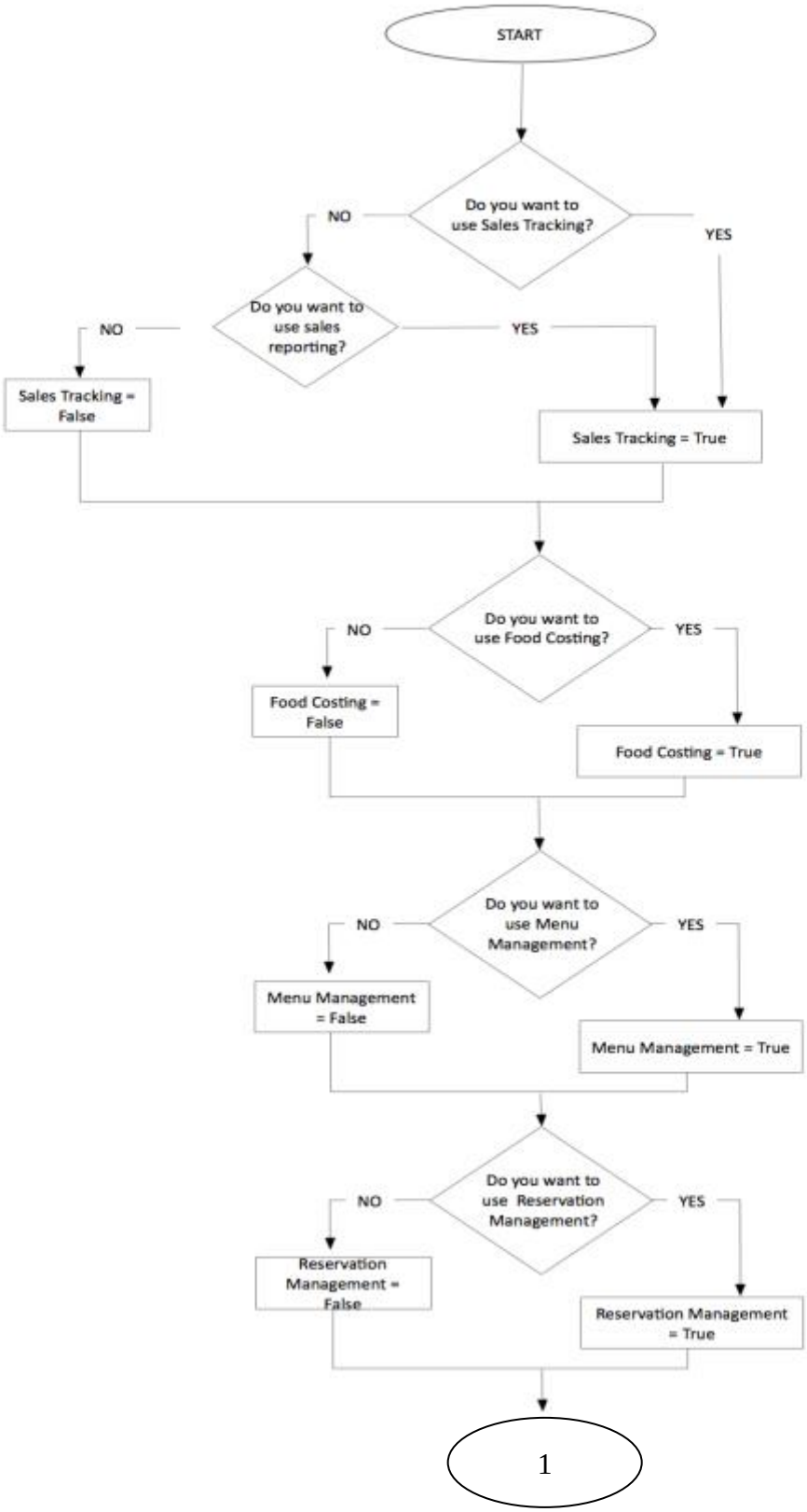
Stage 2. Key characteristics

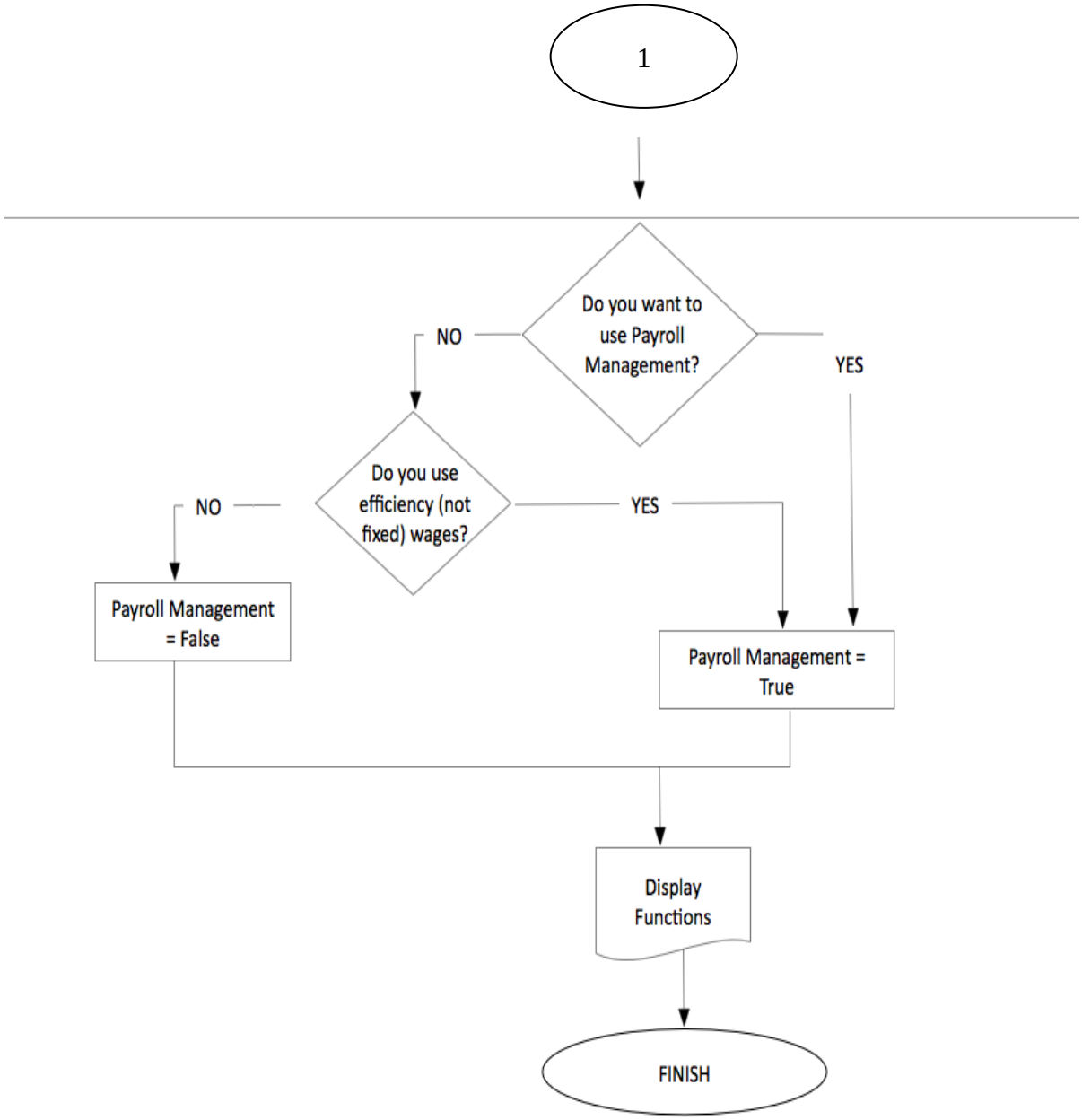



1
Do you need analytical function (Big Data)?
NO
Do you want to analyse statistical reports?
NO
Big Data = False
YES
YES
Big Data = True
Do you have experience in RMIS use?
YES
NO
Can you organise training internally?
NO
YES
Training = True
Training = False
Display Characteristics
See Stage 3
FINISH

Appendix 3

Stage 3. Additional functions




1
Do you want to use Payroll Management?
NO
YES
Do you use efficiency (not fixed) wages?
NO
YES
Payroll Management = False
Payroll Management = True
Display Functions
FINISH