PROCESS MAPPING AS AN EFFECTIVE SAFETY TOOL IN THE AIR TRANSPORT PROCESS

Michaela TIRPÁKOVÁ
Technical university of Kosice, Faculty of Aeronautics, Department of Air traffic Management, Slovakia
michaela.tirpakova@tuke.sk

Monika BLIŠŤANOVÁ
Technical university of Kosice, Faculty of Aeronautics, Department of Air traffic Management, Slovakia
monika.blistanova@tuke.sk

Peter HANÁK
Technical university of Kosice, Faculty of Aeronautics, Department of Air traffic Management, Slovakia
peter.hanak@tuke.sk

Abstract
The article is devoted to process mapping and the design of a process map of the air transport process using available open-source online software/tools. The air transport process is a complex process that requires mutual coordination of individual activities to meet the process's objectives. At the input of this process are the requirements of the passenger, which enter the provision of the flight, and at the output is the measurement of customer satisfaction. Processes usually have duplication and inefficiencies, that can be effectively corrected once the process is appropriately documented. The process map provides a holistic view of the processes, describes their relationships, stakeholders involved and clearly explains them. At the same time, it enables the subsequent modification of the process, which is based on the needs of the air carrier and the fulfilment of the requirements of the customer. There is currently very little research on mapping the air transport process, and such a process map is a new perspective.
Keywords: *aviation, air transport process, process mapping, process map*

1. INTRODUCTION

In its simplest definition, a process is a combination of inputs, actions, and outputs. In the business world and personal lives, accurate assessments of processes can significantly impact accomplishments (Keller and Jacka 1999). A business process combines activities within an organization with a structure defining their rational order and dependence to create the desired result (Pojasek 2005). Business process modelling allows a shared understanding and examination of a business process. A process model can provide a complete experience of a process. An organization can be examined and incorporated via its business processes (Aguilar-Savén 2004). Organizations are inclining towards becoming more process-oriented to ensure more satisfactory customer outcomes. A method that allows achieving and performing such process orientation is business process management (BPM). In this regard, business process modelling is applied to illustrate business processes graphically (Malinova 2014). Business process management (BPM) has grown into a mature discipline, with a well-established set of principles, tools, and methods incorporating information technology, management sciences, and industrial engineering to improve business processes (van der Aalst 2016). BPM guides process performance, applying technology to automate processes. It is also an approach to modify an organization by employing different tools, including business processes mapping. A process mapping displays a diagrammatic representation that pictures a sequence of steps within a given process. It leads to understanding the organization set-up and departmental functions and interrelationships. Plus, it defines the scope of various operations, stakeholders' identification, and it is helpful for the risk management process (Al-Fedaghi and Mohamad 2019). Business process management (BPM) plays a crucial role in any organization – more so in the business aviation industry. BPM helps organizations have consistently remarkable outcomes using well-defined, optimized, and appropriate processes. These processes' definition involves significant decisions that should be clearly outlined in a well-thought-out work plan, reduces the possibility for error, quickening reaction time when failures happen, and better outcomes

(Brechter 2022). Aviation is a particular sector that focuses primarily on the safety and quality of services provided. Therefore, the processes are more complex, and their preparation and provision are more thorough. Designing and correctly describing processes in air transport requires sufficient knowledge not only in the field of business process management but also in the field of safety, including the inevitable requirements placed on the air carrier. The relevant legal framework regulates the safety issue, including risk management, in Commission Regulation (EU) no. 965/2012, in which the requirement ORO.GEN.200 specifies the obligation to implement and proactively use the Safety Management System (SMS) (Hamdi 2018). In general, process mapping is still a relatively unexplored area in aviation. The absence of process mapping in aviation is shown by relatively little research, which deals mainly with describing or mapping specific activities, such as aircraft maintenance (Raju 2011), enhancing safety and control maintenance of humans (Piechoczek et al. 2017) or mapping at aviation universities (Thatcher 2009). Still, it does not specify the processes (specially air transport process) as an interacting whole. The main reason may be the complexity of processes, emphasizing safety and compliance with safety management system (and the risk management) requirements. As this system should be proactive, systematic, and transparent, processes must be regularly checked and documented. Plus, aviation safety does not have enough methodological guidelines in this area, and there are no official valid checklists or prompt lists that would be very helpful.

2. METHODOLOGY

The qualitative part of the research was focused on collecting data about the process, process mapping, air transportation process and process mapping in aviation. For the data collection, a standard search approach and methods were used. Online academic databases (particularly Web of Science) were explored by using the search terms "process", "process mapping", "process map", and "aviation". Traditional analysis, synthesis, description, standard search methods, and frameworks were used to develop the article. The following part of the research was focused on a thorough study and selection of business process management tools. Currently, many non-commercial or open-source programs or software allow working quickly and easily. The software features are user-friendly and provide wide use throughout the companies. A BPM platform minimally contains a graphical business process and rule modelling capability, a process registry to manage the modelling metadata, a process performance engine. For the article, a more straightforward open-source tools were used (miro.com), which enabled the creation of a mind map, process map and stakeholder map.

The article is focused on a complete understanding of the air transport process and its description. In the first phase, an easy mind map was created, which serves as an introduction to the issue. It simply explains the relationship between individual air carriers, processes, and outsourcing possibilities. In the second phase, the air transport process was described, divided into three fundamental lines through a process map. All lines interact and create a complete view of the process. The main activities of individual processes were also described. The last part was dedicated to identifying stakeholders who create an important safety context. A simple map of stakeholders was created to describe the processes involved.

3. AIR CARRIER AND AVIATION PROCESSES

Air transport is operated by different air carriers (national, full-service, low-cost, etc.) that use or lease aircraft to provide an entire or part of the air transport process. Customers can be individuals, travel agencies or various companies, entrepreneurs, or postal authorities. Considering the nature of aviation activities, it is now possible to observe different categories of airlines with specific business models on the market (Alternative Airlines 2022). These models significantly affect the processes of the air carrier and its intentions. Still, it can be said that despite the differences in business models, the air transport process remains the same. A process is an event that begins at a certain point, passes through another point, and ends at a certain point - it has a precise trajectory and goal. In the beginning, there is an assumption and its result at the end (Bititci and Muir 1997). Every process has an input or supplier (client) at the beginning and a customer (owner) at the end, is repeated and phased and can be decomposed into activities (Tovia 2022). Aviation processes are basically the same as classic business processes in

other field of interest; at the beginning, there are customer requirements, and at the end, customer satisfaction, i.e., measuring customer satisfaction. The significant difference is that all aviation processes have difficulties managing risks that follow from the implementation and active use of the safety management system. The main priority is process safety and proper stakeholder identification, followed by a risk management process. Therefore, all processes should be adequately described and documented (Yilmaz 2019). Typical air carrier processes can be categorized into three primary processes (Midkif et al. 2004):

(M) management - an area of management and planning, administration, quality management system (QMS), business process management (BPM), marketing, documentation, resource management, etc. These processes can be fully or partially outsourced and are based on the basic activities of management (planning, organizing, leading, controlling).

(P) primary (main) - process, which is provided by the air carrier, and which is directly related to the flight. These processes consist of flight preparation (pre-flight briefing), flight, and flight evaluation (post-flight briefing).

(S) support - used to support operations in terms of IT, maintenance, safety/security, infrastructure, etc., in this case, it is a high probability of outsourcing.

The following mind map (Fig. 1) shows the position of the air carrier in direct relation to the processes and possibilities of outsourcing. This scheme helps to understand better the analogy and definition of the relationships between airlines, processes and outsourcing and provides a reasonable basis for further processing in the process map.
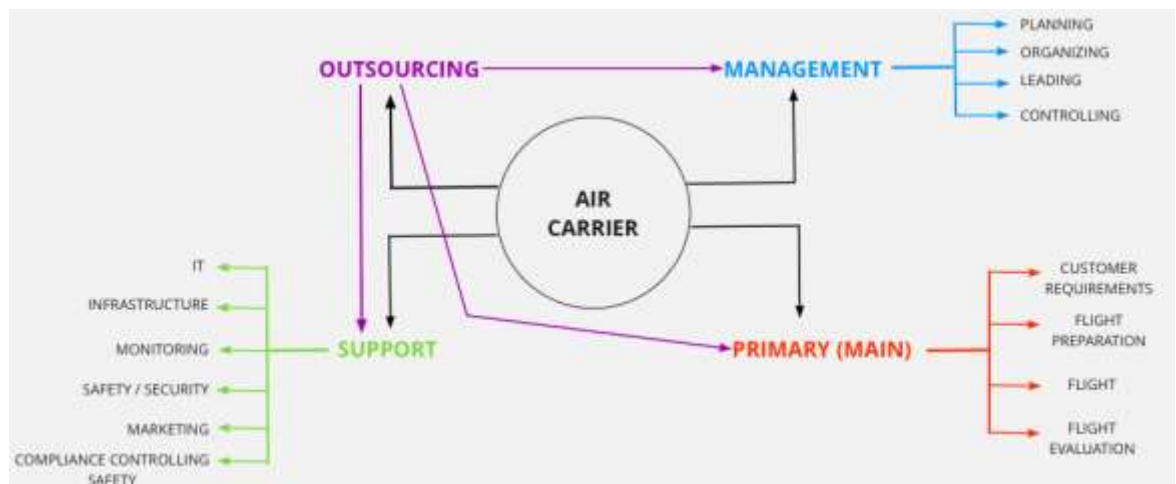

FIGURE 1 - SIMPLE MIND MAP WITH RELATIONSHIP OF AIR CARRIERS, PROCESSES, AND OUTSOURCING
Source: own elaboration

The scheme (Fig. 1) shows that the processes that air carriers deal with are significantly affected by the possibility of outsourcing. Airlines' outsourcing services mainly include ground handling, catering, advertising, rental of equipment and warehouses, fuel, banking, and technical services (Polat and Korkmaz 2018).

4. PROCESS MAPPING

Business process management (BPM) has happened into a confirmed management discipline and its importance in the automation-centric corporate economy of today is unquestionable. Without capable BPM software or appropriate tools in business, processes become disorganized and have unpleasant or disastrous consequences (especially in aviation). BPM tools create a systematic method to optimize business processes and as the discipline developed, several BPM tools have appeared (KissFlow 2022). Several BPM and other management software (KissFlow, ProcessMaker, Zoho Creator, Nintex, Bizagi,

Wrike, Miro) have been examined to determine the best article purposes for the practical process mapping, most of them are paid tools and platforms (monday.com, Process bliss, Creatio, Quixy, Process, etc.). Use, availability, and access are more complicated (or, in some cases, inaccessible for regular, non-business use); the online platform Miro.com was chosen for article purposes.

Miro is an online open-source platform that empowers work and functions are an excellent benefit for efficient work and have made it possible in the simplest way to create a framework for the air carrier's processes (Miro 2022). The following figure (Fig. 2) displays the graphical form of the process map, which highlights the three main lines (management processes, primary (main) processes and support processes). Each line details the process and determines where and how decisions are made within each step of the process. At the same time, safety is managed on this basis, and threats that may arise from each process can be easily identified during the risk management process.

Management processes (M) are established on fundamental management functions: planning, organizing, leading, and controlling. Within this line of processes are divided into:

M1: management accountabilities, an explicit focus on performance and compliance with rules. It needs to hold managers responsible for outcomes by assigning them responsibility, empowering decision-making authority, and giving them the autonomy and resources to accomplish the desired results.

M2: marketing refers to an air carrier's activities to promote the service (advertising, selling, and providing products (services) to customers or other companies).

M3: documentation, up-to-date and correct (includes plans, reports, applications, certificates, permits, etc.).

M4: resource management, for human resources, financial, tangible and intangible, etc.

Primary (main) processes (P) describe the typical activities of the air carrier and ensure the preparation of the flight, including the entire flight and flight evaluation. These processes are directly dependent on the quality of management and support processes.

P1: flight preparation consists of the marketing part and creating a flight plan. The airline must take a responsible approach to manage those processes necessary for the quality processing of customer requirements, including market requirements, and consider potential threats. Overlooking any preparatory process can result in many difficulties, and the identified threats can pose significant economic, organizational, or other risks.

P2: flight is the primary process, which has its specifics, and any mistake at this stage can have fatal consequences for the lives and health of passengers, crew or other persons on the ground, property, airline reputation and so on. All activities that precede the flight should help to ensure its quality and especially safe performance.

P3: flight evaluation, a meeting focused on a thorough flight evaluation. During the flight, there may be situations that need to be discussed with the crew, prepare a flight report and other supporting documents if an incident has occurred, etc.

Support processes (S) help to support the primary process and actions of the air carrier. Support processes can vary, depending on airline size, goals, resources, and outsourcing opportunities.

S1: IT, technological improvement has been the influential factor for enhancing airlines' operational efficiency. Airlines can reduce costs and improve operations by utilizing progressive IT solutions, aircraft technology, and mobile technology.

S2: maintenance is a highly regulated area requiring a complete regimen of scheduled and unscheduled maintenance (line, base), examination, testing, repair, and overhaul or transformation activities.

S3: infrastructure management aims to improve and advance the sustainable development of aviation infrastructure for the provision and operation of airlines, airports, and air navigation services.

S4 safety/security. Aviation safety refers to the actions taken to ensure airplanes are free from factors that may lead to damage or loss. Aviation security is one part that may affect passenger safety. It is not related to the airplane itself, but instead to intelligence gathering, pre-boarding procedures and airport security personnel.

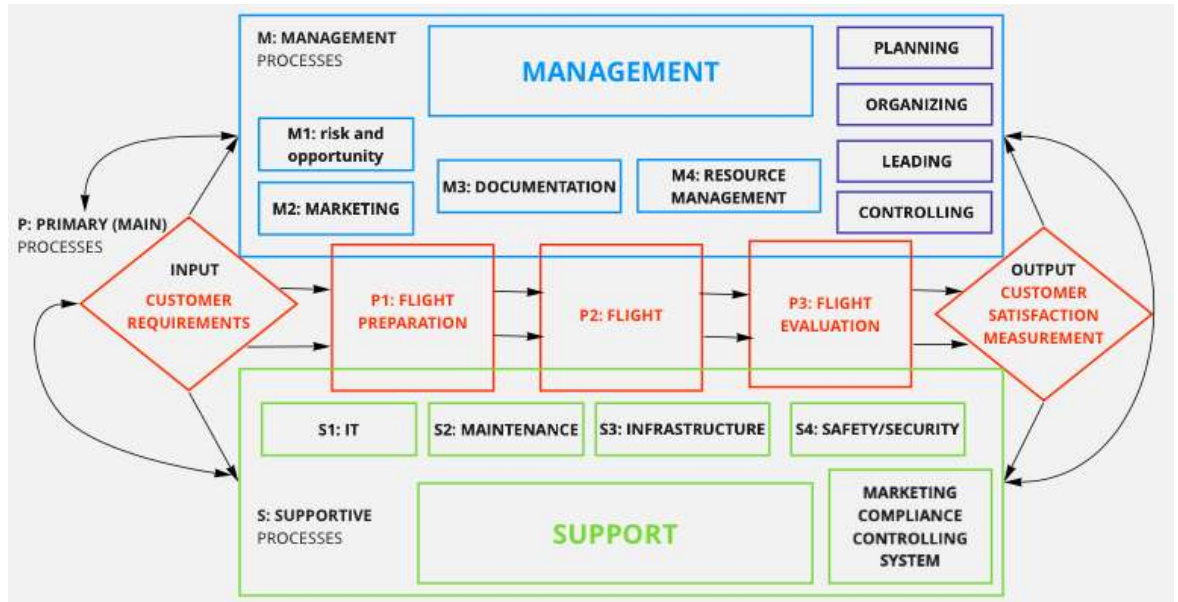Airworthiness management system and compliance controlling system.

FIGURE 2 - GRAPHICAL SCHEME OF THE PROCESS MAP FOR AIR CARRIER, WHICH HIGHLIGHTS THE THREE MAIN LINES (MANAGEMENT PROCESSES, PRIMARY (MAIN) PROCESSES AND SUPPORT PROCESSES)
Source: own elaboration

It is possible to assign individual air carriers' responsibility for selected processes concerning business models and process maps. Of course, it is also necessary to think about the possibilities of outsourcing, which are currently very widespread in the aviation industry. The graphic scheme of the process map and its active use in practice has many benefits. As the individual processes are precisely defined, described, and implemented, it is also simpler to identify specific activities related to the processes. The following figure (Fig. 3) illustrates some of the activities that cover the processes.
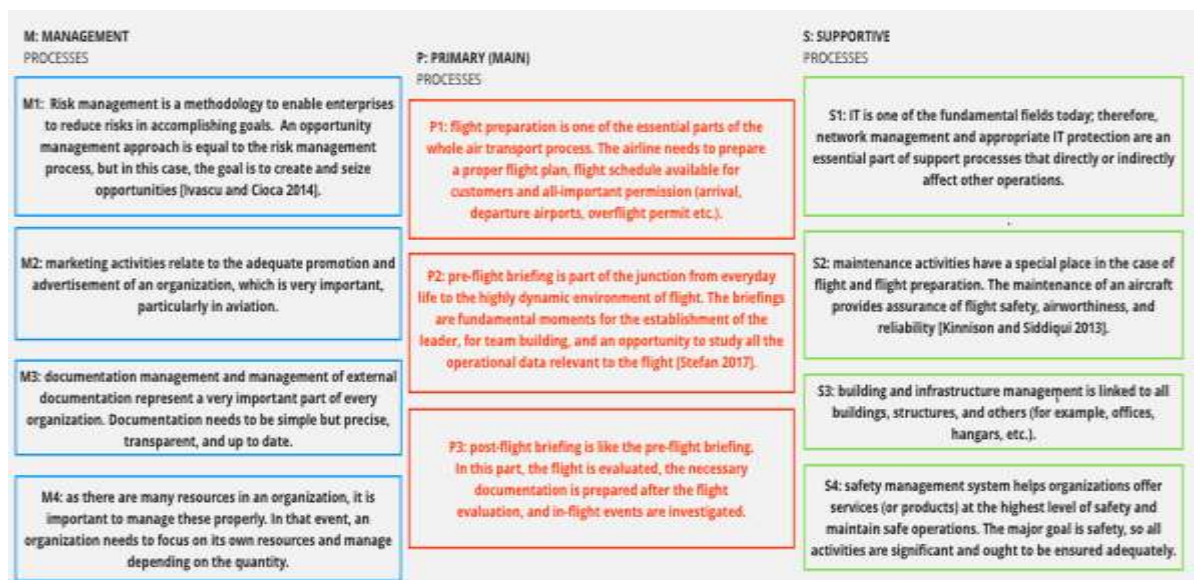

FIGURE 3- GRAPHICAL SCHEME OF THE MAIN ACTIVITIES LINKED TO PROCESSES LINES (MANAGEMENT PROCESSES, PRIMARY (MAIN) PROCESSES AND SUPPORT PROCESSES) DEFINED IN THE PREVIOUS SECTION
Source: own elaboration

The use of process maps is widely used across the company. The process map benefits all activities from planning, marketing, information technology, and resource management to flight preparation, flight, and flight evaluation. These are easy to use because such a map is clear, transparent, and straightforward. In addition, it provides space for modification according to the needs of each process or even activity. Furthermore, a process map helps identify risk with risk owners, including stakeholders' identification which enter the process. It is more difficult to define the risks of the air transport process precisely, given that it is a very complex process involving many activities. Risks are of an economic, technical, organizational, or other nature and may have different impacts on processes, operations, and stability. The process map can be further extended by a stakeholder map, which can be independent or summative. A stakeholder identification can help capture and describe who the stakeholders are, their roles in the activity and participation. It is essential to know the stakeholders because they create risk management contexts. Stakeholders can be internal or external (Fig. 4).
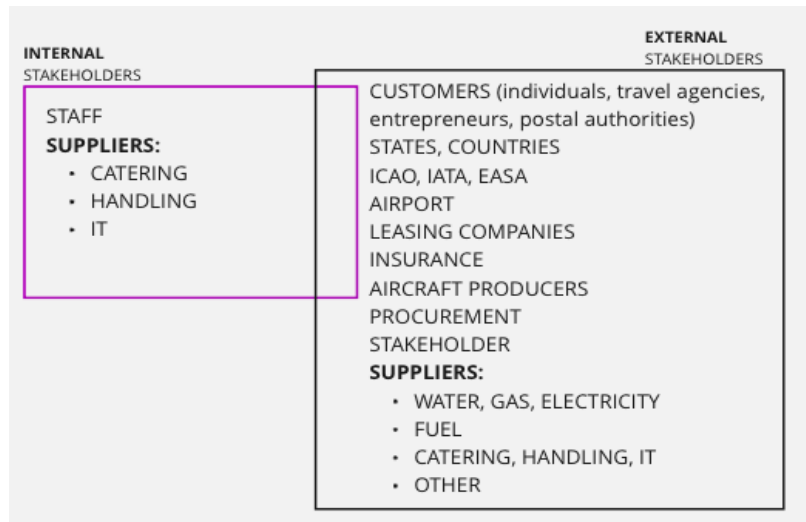

FIGURE 4 - STAKEHOLDERS – INTERNAL AND EXTERNAL
Source: own elaboration

Stakeholders' specifics should also be described, and a suitable form is a stakeholder map. A stakeholder map is also a brief diagrammatic representation of the stakeholders with their interests. Article map contains internal and external stakeholders who enter the individual processes. The same marking structure (ALL, M-Management, P-process, and S-support) was used for their determination.
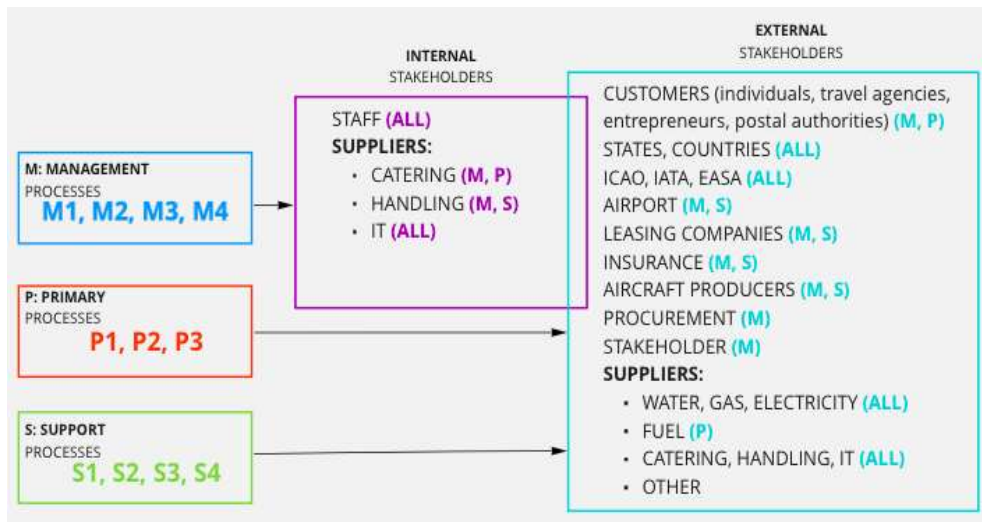

FIGURE 5 - STAKEHOLDER'S MAP AND ASSIGNMENT TO INDIVIDUAL PROCESSES, WITH STANDARD MARKING STRUCTURE (M, P, S AND ALL)
Source: own elaboration

4. CONCLUSIONS

The air transport process is characterized by the complexity of individual activities, emphasizing safety and compliance with the relevant requirements in this area. It requires mutual coordination between the operations and activities and comprehensive knowledge of the context, such as the stakeholders involved in the process. The main goal of the process is to ensure the flight, i.e., the safe performance of the customer's specific (allergies, cultural, comfort, etc.) requirements, which is measured at the end through measurable key performance indicators (KPIs – waiting time, baggage loss, the entire experience, etc.). Therefore, processes need to be adequately understood to achieve their purpose.

A helpful tool is a process map representing a holistic and comprehensive view of an organization's processes and significant connections. By establishing a process map, an organization can benefit from many points of view, for instance, clarity as via process map organization have a broader perspective of how the organization operates, customer connections, risk mitigation by comprehending how the pieces of the operational work and where threats could arise and stakeholders' identification. This article deals with processing the process map of the air transport process, whereby three fundamental lines of processes were defined (management, primary, support). In the first part of this article, a mind map was developed, which emphasized the position of the air carrier (concerning defined business models) and processes, including the possibility of outsourcing. The second part of the article dealt with elaborating a process map, which described the air transport process simply and understandably. It is clear from the process map that the processes interact and create a comprehensive system that can be modified according to the needs of the air carrier, the customer, and the market. The last part of the article focused on stakeholders and extended the process map to these stakeholders, given that they provide an essential context for risk management.

Although there are currently not many authors dealing with the issue of process mapping in aviation, this area is beneficial and can bring significant changes in the understanding and safety support.

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