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State-of-the-Art of Messaging for Distributed Computing Systems

Abstract:

Modern software applications rarely live in isolation and nowadays it is common practice to rely on services or consume information provided by remote entities. In such a distributed architecture, integration is key. Messaging, for more than a decade, is the reference solution to tackle challenges of a distributed nature, such as network unreliability, strong-coupling of producers and consumers and the heterogeneity of applications. Thanks to a strong community and a common effort towards standards and consolidation, message brokers are today the transport layer building blocks in many projects and services, both within the physics community and outside.

Moreover, in recent years, a new generation of messaging services has appeared, with a focus on low-latency and high-performance use cases, pushing the boundaries of messaging applications. This paper will present messaging solutions for distributed applications going through an overview of the main concepts, technologies and services.

Keywords:

messaging; message-oriented middleware; MQ; message queuing; distributed systems

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Introduction

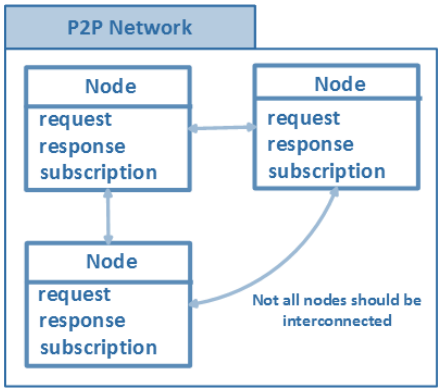
This paper presents an overview of messaging concepts, functionalities and modern technologies. It starts with an introduction of messaging for distributed communication and system integration. A review of the main messaging features is then provided, followed by an overview of the major technologies for messaging, from broker to broker-less systems. In conclusion, a list of successful CERN's stories concerning the use of messaging for solving the communication problem of distributed applications is presented.

Message-oriented middleware

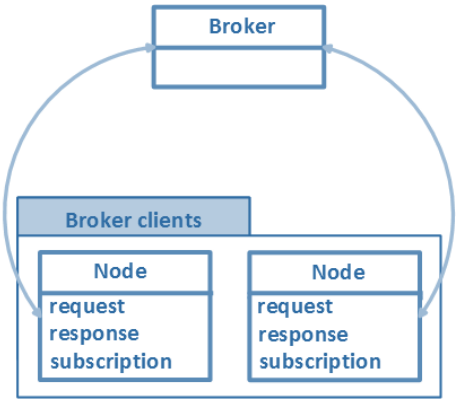
To cope with increasing demands on scalability, flexibility, and reliability, a message-oriented middleware (MOM) is an infrastructure for loosely coupled interprocess communication in an enterprise service bus or clouds [1] [2]. Particularly in clouds, loose coupling allows to rapidly scale message producers and consumers. A message with respect to MOM is an autonomous, self-contained entity that models an event and separates into a header and a body or payload. The middleware provides technical means of exchange, so a peer can exchange messages with other connected peers. A central concept in MOM is the notion of a message queue (or channel) for storing, transforming, and forwarding messages. Message queues enable asynchronous interaction, and a simple form is a First-In-First-Out (FIFO) queue. There are two different approaches to MOM using message queues as shown in Fig. 1.:

- Peer-to-peer messaging. A unified middleware component in every peer coordinates discovery and interaction between peers.
- Broker-based messaging. The middleware acts as a broke to provide a messaging infrastructure between the heterogeneous peers.

Peers can participate as client, service, or both [1]. A broker reduces the communication complexity between a numbers of peers but can incur delays in real-time applications because an additional store-and-forward procedure is necessary. [3]



a)



b)

Figure. 1. A message-oriented middleware abstracts communication between heterogeneous peers: (a) Peer-to-peer messaging; (b) Broker-based messaging

In terms of interaction patterns, a trivial message queue allows bilateral Send and Receive, for asynchronous messaging, and multilateral One-to-Many Send, e.g., publish-subscribe. Using message queues in a broker architecture allows to implement sophisticated routing patterns. In general, a MOM is characterized by Curry [1]:

- Messaging specification. A MOM needs to specify th format of messages and transport

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mechanisms. Interconnectin proprietary MOM systems is achieved through adapters or bridges.

- Message filtering. A core functionality of a MOM is filtering for message delivery. Curry [1] distinguishes:

  o A channel-based system offers predefined groups of events as channels, where clients can subscribe to.

  o Messages in a subject-based system carry metadata in the message header, e.g., a subject. A client subscribes messages, where the metadata matches some given pattern.

  o In a content-based system, a client subscribes messages, where the message body satisfies a set of properties expressed in a query language.

  o Composite events functionality extends a content based filtering with property matching across sets or sequences of messages.

- Message transformation. Messages can originate from various heterogeneous sources and consequently carry all kinds of content types as payload. A MOM can offer APIs to modify messages, e.g., XML transformations.

- Integrity, reliability, and availability. A MOM can have properties to increase the overall Quality-of-Service:

  o Transactions and Atomic Multicast Notification;

  o Reliable message delivery: at-least-once, exactly-once, or at-most-once;

  o Guaranteed message delivery by acknowledgments;

  o Prioritization of messages;

  o Load balancing over several brokers or queues; and

  o Message broker clustering for fault tolerance.

A MOM is typically accessed through an API to abstract the technical details of message exchange. Due to the transport-agnostic design of SOAP/WS-* services, a MOM can also serve as a transport mechanism for SOAP messages. [3]

Java Message Service

The general purpose API named Java Message Service (JMS) [4] is maintained in a Java community process for MOM support. JMS defines a number of operations for creating, sending, receiving, and reading messages. It is transport-agnostic to abstract messaging from MOM implementations and therefore relaxes vendor lock-in. JMS is a universal interface for interacting with heterogeneous messaging systems [1]. A message body is dynamically typed according to the content type information stored in the header.

Some examples for JMS-enabled software implementations are the JMS reference implementation OpenMQ [5], IBM Websphere MQ [6], or TIBCO Enterprise Message Service [7]. [3]

RESTful Messaging Service

The motivation for RESTful Messaging Service (RestMS) [8] is Web-compatible messaging by using HTTP as transport mechanism and REST principles to describe locations, i.e., URLs, where messages can be posted to and received from. RestMS is an API specification, where XML-based messages are sent and received using HTTP methods. With respect to the REST service, resource locations are distinguished into feeds for incoming and pipes for outgoing messages. Feeds are joined with pipes on the service-side for message distribution. Message types in RestMS refer to XML, JSON, and a set of MIME content types for dynamically typing data. The specification also includes profiles to connect to other messaging infrastructures, e.g., AMQP. [3]

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Open Middleware Agnostic Messaging API

Due to the diversity in middleware standards and wire formats, the Open Middleware Agnostic Messaging API (OpenMAMA) [9] initiative is an attempt to provide a single API for developing applications spanning across multiple MOMs. For correct translation messages and operations, a MOM has to provide a so-called OpenMAMA bridge implementation.

OpenMAMA is available as open-source library. It offers a built-in bridge for AMQP-enabled Apache Qpid and supports several bridges for proprietary messaging infrastructures in the finance sector. [3]

Proprietary messaging solutions

MSMQ [10] is a MOM for standalone integration or as a transport mechanism in Microsoft's WCF, next to Web services and COM+. It offers guaranteed message delivery, message routing, transactions, prioritization, and a simple type system for message body types. When used as a transport in WCF, a message body is either XML, binary, or ActiveX format. Beside its proprietary protocols, messages can also be transmitted over COM+. In terms of security, MSMQ allows authentication and encryption of messages. There is no broker in MSMQ; similar to Fig. 18a, a queue is hosted locally on a peer, and processes can store and retrieve messages. In terms of service interaction patterns, MSMQ is bilateral Send and Receive. MSMQ can exploit IP multicast to replicate a message for addressing multiple queues. A Microsoft alternative with brokerage support is SQL Server Service Broker [11].

Other proprietary MOM software products are the brokerless TIBCO Rendezvous [12], which uses direct connections between peers similar to MSMQ, Oracle Tuxedo Message Queue [13] as part of the Oracle Tuxedo application server for cloud middleware, and Terracotta Universal Messaging [14]. [3]

Advanced Message Queuing Protocol

Historically, MOM solutions have relied on proprietary protocols, and JMS is an attempt to agree on a compatible interface. Interoperability between varying MOM solutions is still difficult; costly JMS adapters or bridges are necessary to connect different transport mechanisms. AMQP [15] unifies messaging through an agreed-on wire format and has a similar role like HTTP in Web applications. While the OASIS AMQP 1.0 standard is restricted to the transport model for interoperability over the Internet, messaging architectures are specified by the AMQP working group [16].

The AMQP specification distinguishes a transport model and a queuing model [17]. The semantic queuing model defines terms like message, queue, exchange, and binding with respect to AMQP. Messages always end up in queues which are analogous to postal mailboxes. A queue stores messages and offers functionality for searching, reordering, or transaction participation. If a client wants to send a message, it chooses a broker-like exchange which is responsible for delivering messages to queues. An exchange can be offered as a service, and there exists an individual URI scheme (amqp: or amqps:) [18] to locate an exchange. A binding is a set of queue-specific arguments for an exchange. As shown in Fig. 2., there are different exchange types with respect to message filtering capabilities [19]:

- In a direct exchange, a message has a routing key and is sent to the queue, whose binding is equivalent to the routing key. In case of multiple queues with identical bindings, multiple message copies are delivered, i.e., a channel-based system.
- A topic exchange forwards copies of a message to all client queues, where the message routing key matches a queue's binding pattern, i.e., a subject-based system for publish-subscribe delivery.

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• In a fan-out exchange, messages are forwarded to a set of queues without a specified binding, i.e., channel-based system.

• A headers exchange matches the headers of a message against predicate arguments of client queues beyond the routing key, i.e., a content-based system.

Messages are finally fetched from queues by consumer processes. AMQP provides guaranteed delivery, authentication, wire-level encryption, and transaction-based messaging for reliability. In terms of patterns, an exchange applies pattern Send in case of direct delivery or One-to-Many Send in other cases. Due to the self-contained type system and self describing message content, messages are dynamically typed in AMQP.

Examples for JMS-compatible broker implementations are OpenAMQ [20], JORAM [21], WSO2 Message Broker [22], SwiftMQ [23], Apache Qpid [24], and Red Hat Enterprise MRG [25].

AMQP defines four types of exchanges. A producer creates a message and sends it to an exchange. Depending on the exchange type and bindings, the message is delivered to queues, where consumers can fetch it from (a) direct exchange; (b) topic exchange; (c) fan-out exchange; (d) headers exchange. [3]

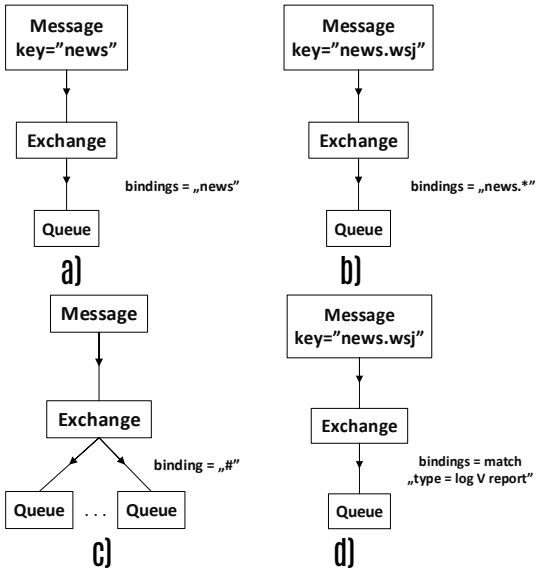

Figure. 2. AMQP types of message exchange

Extensible Messaging and Presence Protocol

While the XMPP [26][27][28] has been intended as an open standard for instant messaging, presence information, and contact list maintenance in chat applications, it also has middleware properties. In its base specification, XMPP exchanges messages as XML stanzas in client-to-service and service-to-service communication for federated services. An XMPP service therefore takes the role of a broker.

XMPP is particular attractive for MOM scenarios, where Web agents are involved because it supports HTTP as transport mechanism and most Web browsers and JavaScript runtime environments are capable of processing XML stanzas. Furthermore, XMPP is also considered as a suitable messaging protocol for Internet of Things applications [29]. The protocol is extensible, and extensions are specified in a community process. MOM-specific extensions are:

• Transfer of Base64-encoded binary content with an assigned MIME media type [30];

• RPC over XMPP [31];

• Service discovery [32];

• Publish-subscribe [33] for broker scenarios, extended addressing [34] for message routing, and event notification extensions [35][36];

• Reliable message transport [37]; and

• SSL/TLS protected transport mechanism and S/MIME [38] for end-to-end message encryption.

By default, messages in XMPP are XML stanzas and bodies are restricted to text only; there exists a notion of message type, but it is limited to instant messaging applications. Therefore, out-of-band signaling or a custom protocol, e.g., XMPP bits of binary [39], is required to discover message content types in a middleware scenario.

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XMPP can also serve as a messaging infrastructure for SOAP/WS-* Web services [40] [41]. Beside instant messaging, XMPP has been successfully deployed in the VIRTUS middleware for Internet of Things applications [42] using the real-time collaboration server software OpenFire [43]. Another software that offers XMPP messaging over Web-Socket is the Kaazing WebSocket Gateway [44]. [3]

Streaming Text Oriented Messaging Protocol

The simple text-based wire protocol STOMP [45] is for asynchronous message exchange between a client and a service or broker with simplicity and interoperability in mind. In the open standard of STOMP, a client and a service establish a session and asynchronously exchange frames of type Message, Receipt, or Error; a frame is partitioned into a command, header fields for metadata, and content of a certain MIME type. Messages are therefore dynamically typed. The protocol supports transactions and acknowledgments for reliable message delivery.

STOMP supports either bilateral messaging, i.e., Send and Receive, or broker-based publish-subscribe for One-to-Many Send interaction. Two notable service implementations are CoilMQ [46] and, for the latest protocol version 1.2, Stampy [47]. [3]

Message Queue Telemetry Transport

MQTT [48] originates from IBM and is now an open OASIS standard [49] for lightweight machine-to-machine messaging and Internet of Things applications, where bandwidth is limited. MQTT is intended for broker-based publish-subscribe architectures, One-to-Many Send interaction. An MQTT message can encapsulate binary payload up to 256 megabytes, but there is no notion of content type. The participating parties therefore have to agree on allowed formats out-of-band. For reliability, the protocol offers acknowledgments and retransmissions, but there is no transaction functionality.

Two notable MQTT broker software implementations are HiveMQ [50] and Mosquitto [51]. Both support Web clients using WebSocket. Another application that relies on MQTT messaging is Facebook Messenger [52].

Data Distribution Service for real-time systems

The open standard DDS [53] specifies a machine-to-machine MOM for publish-subscribe message distribution, real-time message delivery, scalability, and high throughput. Fields of application include the finance and defense sector, industry, aerospace, Internet of Things, and mobile devices [54].

Contrary to MQTT, DDS facilitates a data-centric, peer-to-peer interaction in the spirit of Fig. 1. (a). A domain partitions entities such as publisher, subscriber, and topic. A topic in a domain has a unique name and a strong datatype for publishing; these types are specified in an IDL, and messages are therefore statically typed. Subscribers in the domain request data via the topic, and publishers in the domain are responsible for message distribution [55].

DDS supports rich Quality-of-Service policies for data transmission. Interoperability between software implementations is achieved by the RTPS [56] wire protocol. To locate endpoints of peers, DDS provides dynamic discovery of publishers, subscribers, topics, and datatypes with respect to topics [54]. Reliable message delivery is achieved by negative acknowledgment when data is missing [57]. Security extensions for DDS, e.g., encrypted transport, are still in a beta state at time of writing [58].

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Notable software implementations are OpenDDS [59], RTI Connext DDS [60], PrismTech OpenSlice DDS [61], and Twin Oaks CoreDX DDS [62]. [3]

Apache Kafka

Developed by LinkedIn, Apache Kafka [63] is a message broker specification and implementation for high-throughput publish-subscribe messaging, i.e., One-to-Many Send interaction. Kafka has an individual binary wire format protocol on top of TCP, and for fault tolerance, it supports clustering of brokers, persistent storage, and replication of messages.

On a conceptual level, Kafka distinguishes between topics for messages, producers that publish messages, and consumers that subscribe to topics. For every topic, a Kafka cluster maintains a partitioned log, where every partition stores an ordered sequence of published messages. The messages are kept for a configurable timespan, and partitions are replicated and distributed over servers in the Kafka cluster for fault tolerance and performance. The distributed log in Kafka guarantees the ordering of published and consumed messages in a certain topic. For a subscribed topic, a consumer maintains an offset in the message sequence to keep track of already processed ones. Through this offset, a consumer can also access older messages if they are still available on the cluster.

A message body is a byte sequence of a certain length and has no notion of type. Content type information therefore needs to be agreed out-of-band or by using a custom protocol. An interface for Web clients to subscribe to Kafka over WebSockets is already in an experimental state [64].

Polyglot message brokers

A natural approach for interconnecting several MOM standards is polyglot message brokerage. Three notable JMS-compliant software implementations in this area are Apache ActiveMQ [65], RabbitMQ [66], and JBoss HornetQ [67].

Beside features for scaling and clustering, the messaging core of Apache ActiveMQ, referred to as Apollo [68], uses the OpenWire [69] wire format, but also supports standards like AMQP, MQTT, and STOMP over WebSockets. ActiveMQ furthermore provides a proprietary HTTP-based RESTful API for Web clients.

RabbitMQ supports AMQP, STOMP, MQTT, and also HTTP as transport. Messages over HTTP can be sent in three ways: a native Web management API, STOMP over WebSockets, and JSON-RPC for Web browser integration.

HornetQ [67] is a MOM that originates from the JBoss application server. It supports AMQP, has an HTTP-based RESTful Web interface, and provides STOMP over Web-Sockets for Web clients. [3]

Message queuing as a service

Message brokerage has become an attractive cloud service. A broker is a critical component in a MOM architecture and needs fault tolerance, regular maintenance, and scalability; a message queue cloud service can eventually reduce cost. Amazon Web Services offers Simple Queue Services (SQS) [70] for transporting untyped text-based messages up to 256 kilobytes. SQS operates on a SOAP/WS-* Web service stack accessible through HTTP and HTTPS bindings.

Google's App Engine offers Pull Queues [71] and Push Queues [72] for messaging and App Engine task distribution. Both queue types are accessible through a RESTful API and use JSON format for messages. While Pull Queues need to be polled, Push Queues rely on webhooks for HTTP-based message delivery. Google has also announced Cloud Pub/Sub [73], a broker-based publish-subscribe messaging service for the App Engine, cloud apps, and Web clients. Using a RESTful API, Cloud Pub/Sub

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distributes JSON based messages according to topics. Subscribers can either poll for new messages or register a webhook for notification. The service supports guaranteed message delivery by maintaining a queue for every subscriber, and messages are removed from the queue, when the client acknowledges the message.

Microsoft also offers two cloud-based messaging solutions: Azure Queues and Service Bus Queues [74]. Azure Queues provide direct messaging between cloud services, and they are accessible through a RESTful interface. Messages are sequences of bytes and therefore not typed similar to Microsoft SQS. Service Bus Queues offer advanced architectures such as publish-subscribe and routing patterns. Windows applications and peers can access a service bus through WCF or directly by HTTP. A Brokered Message in a Service Bus Queue explicitly refers to a user-specified message body content. Service Bus Queues also offer an AMQP interface [75].

Two cloud services that offer AMQP brokerage as a service are StormMQ [76] and IronMQ [77]. CloudAMQP specifically offers the polyglot broker RabbitMQ as a Service [78]. CloudMQTT [79] is another pay-per-use broker for MQTT messaging, e.g., for complex event processing in Internet of Things environments. Rackspace Cloud Queues [80] supports publish-subscribe architectures by a HTTP based RESTful API in the spirit of RestMS. [3]

ZeroMQ and Nanomsg

Although there are many comprehensive messaging systems available, matching with the application requirements could be very difficult and without required performance characteristics. Consequently, in recent years, a new generation of low level messaging services has appeared such as ZeroMQ [81] and Nanomsg [82].

The intelligent socket library ZeroMQ aims for more flexible connectivity between peers. ZeroMQ offers several network transports, including TCP, UDP, and IP multicast, and a number of sockets types for architectural patterns. Messages are delivered to a thread- or process-local queue and made available through a socket. The specification defines the following socket types:

- REQ and REP for bilateral Send-Receive;
- DEALER and ROUTER for routing patterns;
- PUB and SUB for publish-subscribe One-to-Many Send;
- PUSH and PULL for workload distribution through One-to-Many Send and One-from-Many Receive;
- PAIR for asynchronous Send or Receive between two sockets.

ZeroMQ has no notion of broker because it is a socket abstraction. However, a MOM broker could be implemented using ZeroMQ. Messages are sequences of bytes and do not have a specified content type. The content type needs to be agreed on out-of-band or requires a custom protocol.

An attempt to provide ZeroMQ access in Web environments is NullMQ [83]. The JavaScript library uses Web-Sockets and a modified version of STOMP to bridge ZeroMQ messages into Web browsers. ZeroRPC [84] integrates RPC on top of ZeroMQ. Information is serialized as JSON-based MessagePack format and forwarded over ZeroMQ connections. A service interface is dynamically typed, and an ZeroRPC has been used in the dotCloud PaaS.

Nanomsg, however, is a reimagining of ZeroMQ– a complete rewrite in C. It builds upon ZeroMQ's rock-solid performance characteristics while providing several vital improvements, both internal

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and external. It also attempts to address many of the strange behaviors that ZeroMQ can often exhibit.

USE CASE - CERN

This section presents several implementations where messaging-based communication has been successfully adopted to solve the problem of exchange information in distributed system. [85]

CERN Beam Control middleware

The Beam Control department at the CERN laboratory is using messaging for highly reliable control/monitoring/alarm applications for the Large Hadron Collider (LHC). Since 2005, a cluster of ActiveMQ brokers, in a store and forward configuration, is used to collect the critical data generated by the safety systems (e.g. 30 producers, 2MB/s, 4.5K msg/s) and to forward it to many consumers (e.g. monitoring tool, dashboards). Being safety data mission critical, the store and forward configuration allow to completely decouple data production from consumption, preventing misbehaving clients to affect data collection and archiving [86]. Moreover, the LHC Control framework has been recently migrated from CORBA to ZeroMQ as communication layer [87]. [85]

DAQ Online Monitoring

Messaging has been also extensively used in several monitoring tools for Data Acquisition (DAQ) systems, which are responsible to filter and collect data from detectors (e.g. high energy physic experiments) to storage facilities. [85]

The ATLAS TDAQ shifter assistant project

It relies on messaging to distribute operational alarms from private TDAQ network to GPN to a number of heterogeneous consumers. An ActiveMQ cluster is used in a master/slave configuration in order to minimize the impact on the required firewall configuration to a single outbound connection. [88]

The STAR Online framework

It relies on an AMQP-based system for flexible, loosely coupled distribution of detector metadata, using messaging as unified transport layer for processing, storage and monitoring. Moreover, investigation has been done to re-write the control framework over MQTT, profiting from the protocol flexibility and interoperability [89]. [85]

WLCG Messaging Service

Messaging has been also successfully used on large-scale geographically distributed infrastructure. The WLCG (Worldwide LHC Computing Grid) messaging service is the backbone transport layer used for monitoring WLCG sites and services around the world, with more than 50000 clients and an average message rate of 100 KHz. The monitoring infrastructure is based on STOMP with JSON payload. Thanks to the interoperability of the STOMP protocol across several broker flavours, heterogeneous message-broker clusters (ActiveMQ, Apollo or RabbitMQ) are used in a scenario where client applications produce to any and consume to all [90]. [85]

Conclusion

Messaging is pragmatic reaction to the problem of communication in distributed systems. It allows loosely coupled communication acting as intermediate layer between producer and consumer. It brings many benefits in distributed applications flexibility and scalability, with implications in application and infrastructure complexity. Messaging systems are still evolving technology with the AMQP standardization effort pointing in the good direction, but still with partial adoption.

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Message brokers are solid and reliable technology used as transport layer building blocks in many projects and services, both within the physics community and outside. In the recent years, a new generation of systems is promoting messaging for low-latency / high-throughput / data-intensive communication, like ZeroMQ, narrowing use cases and relaxing assumptions, but pushing the boundaries of messaging applications towards new domains and successfull implementations for demanding CERN applications.

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Standard of Fulfilment of Requirements in the Application of TQM in Slovak Republic

Abstract:

In practise are TQM approaches applied through the EFQM Excellence Model and therefore research is focused on organizations which are applying this model and their level of performance in individual criteria are rated within the National Quality Award of the Slovak Republic. The paper objective is describe the current state of implementation of human resources management in organizations that participated in National Quality Award of the Slovak Republic. Organizations included in the research have achieved the highest rating and also are applying the EFQM Excellence Model.

The model is composed of several areas. In the area of human resources management are important the approaches of implementation of human resources management and subsequent prove of results if the stated strategy is carried out efficiently to the employee satisfaction.
This article is written within the project VEGA: "The readiness of industrial enterprises to implement the requirements of standards for quality management systems ISO 9001:2015 and environmental management systems ISO 14001:2014"

Keywords:

stakeholders; employees; EFQM Excellence Model; human resources management; strategy

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Introduction

To be special and stand out - this is one of a number of requirements which modern market places on a functioning organizations. If we seek an answer to the question of what constitutes excellence of the organization, certainly we get the following argument: Excellent organizations achieve and keep the highest levels of performance complying or exceeding the expectations of its stakeholders, which undoubtedly included the employees. Many organizations set-up their activities by respecting the ISO 9001 [3]. Today in Europe is used within the ISO 9001 a certified model that is the result of an initiative of representatives of European organizations called EFQM Excellence Model. Essence of the model is composed in 8 concepts of excellence. One of the concepts is "Achieving success" through by competences of employees and is closely follows on the conception "Developing skills" of the organization. ISO certification provide to the organization re-engineering of its processes and also improvement these processes [4].

Quality management system is based on the ISO/TS standard that focuses mainly on processes and on the satisfaction of customers (intermediate or ultimate); and by which both employees and suppliers are involved [7].

The objective of the model is achieving exceptional results by involving all employees to the improvement of the processes, aspiring to efficient management of the whole organization. Therefore a significant key role in such organizations have employees, creating the prerequisites for the successful implementation of objectives of the organization. EFQM Excellence Model identifies the key roles of leadership, policy and strategy, management of human resources and management of partnership and resources that are implement by the going processes to the results. The results are seen from the perspective of different groups called stakeholders - customers, employees and society. The model is built on two key areas of criteria - assumptions and results. The model is divided into 9 criteria, of which are 5 assumptions and 4 results. While assumptions deal with what is carried out and how it is implemented, results evaluated what has been achieved by means of assumptions. Analysis of the results create space for the suggestions of assumptions improvement thus ensuring continuous quality improvement. The maximum number of points that could be achieved is 1000. Each criterion is evaluated by max. 100 points and criterion 6 (results in relation to customers) a criterion 9 (economic result) are evaluated by 150 points.

Human resources in EFQM Excellence Model

The exceptional organizations appreciate its employees and create a culture that allows the mutually beneficial fulfillment of organizational objectives and personal objectives. Organizations develop competence of its employees and promote fairness and equality. They care, communicate, reward and recognize in a manner that motivates employees inspires commitment and enables them to use their skills and knowledge to benefit the organization. Exceptional organizations in practice define the knowledge, competencies and level of employee performance required for the achievement of the mission, vision and strategic objectives, efficient production plans, developing and retaining talents, develop knowledge and competencies of employees to determine their future employability, motivate employees to engage in improvement and innovation and recognize their efforts and achievements to be involved in the improvement and

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innovations and recognizes their efforts and achievements.

Employees are the most important asset of the organization. The organization manages, develops and release competences and full potential of its people at an individual level to the level of the entire organization in order to support its strategy, planning and the effective operation of processes. Respect and impartiality, open dialogue, empowerment, appreciation and recognition, care and also ensuring a safe and healthy environment are fundamental to creating commitment and employee participation on the route of organization to excellence. Organization management and management of employees is increasingly being important in a time of change. Improving leadership development, talent management and strategic workforce planning are critical since employees are often the biggest investment in the organization. Effective human resources management and leadership of employees allows the organization to achieve its own strategic objectives and would profit on the strengths of employees and their ability to contribute to the fulfillment of strategic objectives. Successful human resources management and leadership support employee engagement, motivation, development and participation. In the context of total quality management is important to understand that only satisfied employees can bring the organization to the satisfied customers.

Strategic and comprehensive approach to employee management and workplace culture and environment are key part of the strategic planning of the organization. Effective human resources management allows employees to effectively and productively contribute to the overall mission and vision of the organization and achieve the organization objectives. The organization controls its strategic objectives with its own human resources so as to identify, develop, deploy and improve transparently improve taking into consideration the optimal success. Issues such as the organization is able to attract and retain ability of employees to develop and deliver products and services in accordance with the objectives set out in the strategies and action plans, taking into consideration the needs and expectations of customers. This includes regular analysis of the current and future needs of human resources and the development and implementation of human resources management with objective criteria relating to recruitment, career development, support, compensation, valuation and evaluation of managerial functions.

The organization identifies, develops and keeps competences of employees. If the organization creates a structure to allow its employees continuously develop their own competences, assume greater responsibility and show more initiative, after that the employees contribute to the development of the workplace. This can be achieved by that they combine their own performance objectives with the strategic objectives of the organization and also by involving them in the development of policies related to education, motivation and valuing of employees. In practice this assumption may be concentrated in competency strategy that describes the need to develop competences of employees and methods of application (e.g. learning from colleagues, working movement/mobility, other training).

Employee involvement is to create and environment in that employees have influence on the decisions and actions that affect their work. It involves creating a culture that supports the mission, vision, and values of the organization in practice, for example recognition and appreciation of creativity, good thoughts/ideas, a special effort. The model focuses on the ability of managers/leaders and employees to actively

cooperate in the development of the organization, demolish the structures by creating dialogue, scope for creativity, innovation and recommendations for improving of the performance. Employees should be supported in order to fully use their potential. A suitable implementation of human resources policy depends on all leaders and managers of the organization by demonstrating that they care about issues related to employees and their personal benefits and that actively promote a culture of open communication and transparency. The commitment of employees may be achieved by formal forums such as the consulting commission and daily dialogue (e.g. the proposals to improvement). It is also good practice to implement satisfaction surveys and leaders evaluations to get more specific evaluation of work climate and the use of results to implementation of improvement.

Standard of human resources management in organizations applying the EFQM Excellence Model

Objective of this paper is to highlight the level of achieving requirements in the organizations in Slovak Republic that implement the EFQM Excellence Model and in the National Prize of the Slovak Republic for quality were among best evaluated. Results are presented for the years 2011-2014. Those organizations can be considered as exceptional in Slovakia. To the evaluation of the level of human resources were selected 18 organizations, thereof 16 business subjects and 2 public administrations.

In order to assess the level of fulfillment of individual concepts of EFQM Excellence Model, is necessary to identify the level of fulfillment of the all criteria of the model, allocate criteria related to the human resources management (assumption criterion 3 and result criterion 7), as well as the total number of points achieved for the organization as a whole.

Assessed organizations have achieved a score between 403 to 562 points. The average value of 18 organizations has reached 368 points. We present point rated only because certain ratios compared to other criteria, respectively organization as a whole.

This paper focuses on monitoring the level of criteria dealing with strategy and human resource management. This area concerns the assumption criterion 3 and result criterion 7. Average rating of evaluated organizations is for assumption criterion 3 employees - 40,01 points and for result criterion 7 results in relation to employees - 30,37.

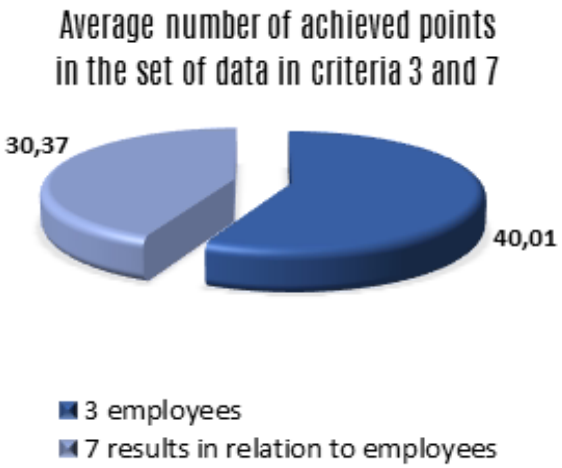

Figure. 1. Average number of achieved points in the set of data in criteria 3 and 7

The Fig. 1 shows that the organizations are trying to create good assumptions for human resources management considering to fulfill of the strategy, vision and mission of the organization. From a lower evaluation result criterion is evident that the assumptions are not always adjusted to the satisfaction of the employees, i.e. the perception of employees is less than leaders expect. Simultaneously result criterion indicates the average performance of processes related to human

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resources management. In terms of process approach to managing human resources it can be concluded that the strength of exceptional companies is planning, fulfillment of plans, but their implementation is not systematically addressed. Improvement of processes related to the human resources management is only in some areas and often does not result from reactions of employee´s side.

Figure. 2. Average number of achieved points in individual criteria

The Fig. 2 shows the average values achieved by individual criteria EFQM Excellence Model in the evaluated organizations. On the chart is clearly to see the balance of levels of each assumption criteria. It follows that the organizations have well established conditions to achieving excellence of the organization, so they have a defined strategy, clearly stated the objectives and these objectives are implemented by competent employees. The question is if the strategy of the organization is fulfilling efficiently and to the satisfaction of all stakeholders.

The Fig. 3 below shows us to convert the point evaluation of individual criteria of model to percentage fulfillment. Here we give the conversion due to the comparison of achieving the level of criteria 3 and 7 in individual organizations that had different overall point evaluation.

Figure. 3. Achieved results in percentages in individual criteria

In Fig. 4 is summary comparison of the level of achievement of criteria 3 and 7 in individual evaluated organizations. Follows from the above that many organizations, even though it is closer to the concept of an exceptional, they inefficiently manage human resources and employees do not perceive approach management to the employees as a very satisfied. This unflattering approach can be noted in the organizations no. 8 12, 16, 17 and 18. Although in organization is created strategy of human resources management, but that is provided to employees, are not that what just suits them.

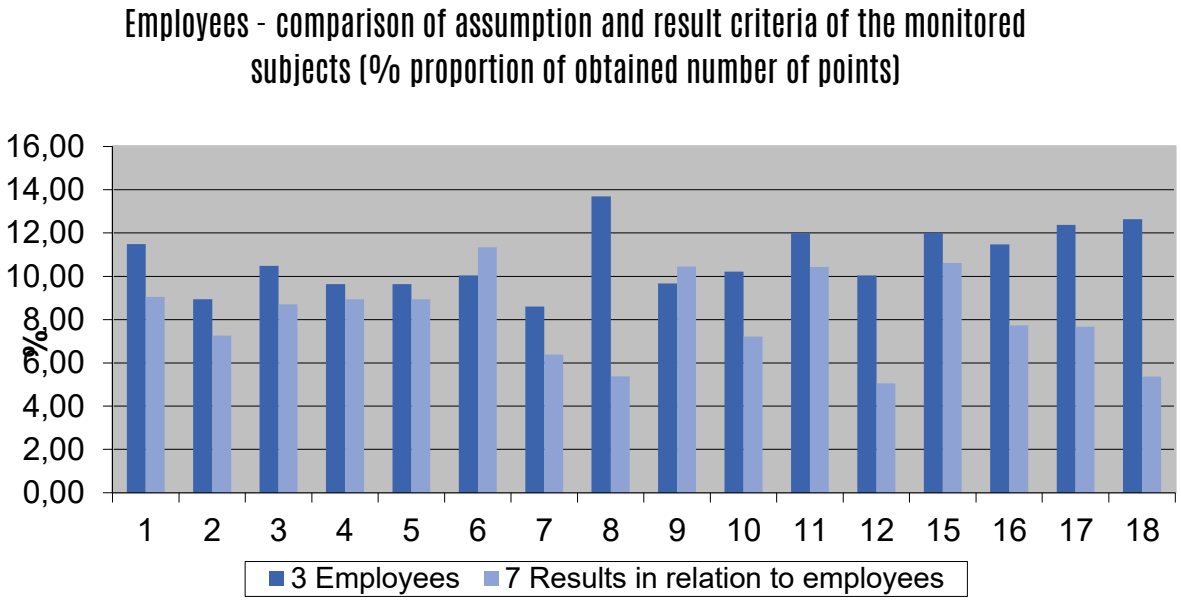

Figure. 4. Comparison of assumption and result criteria in set of data

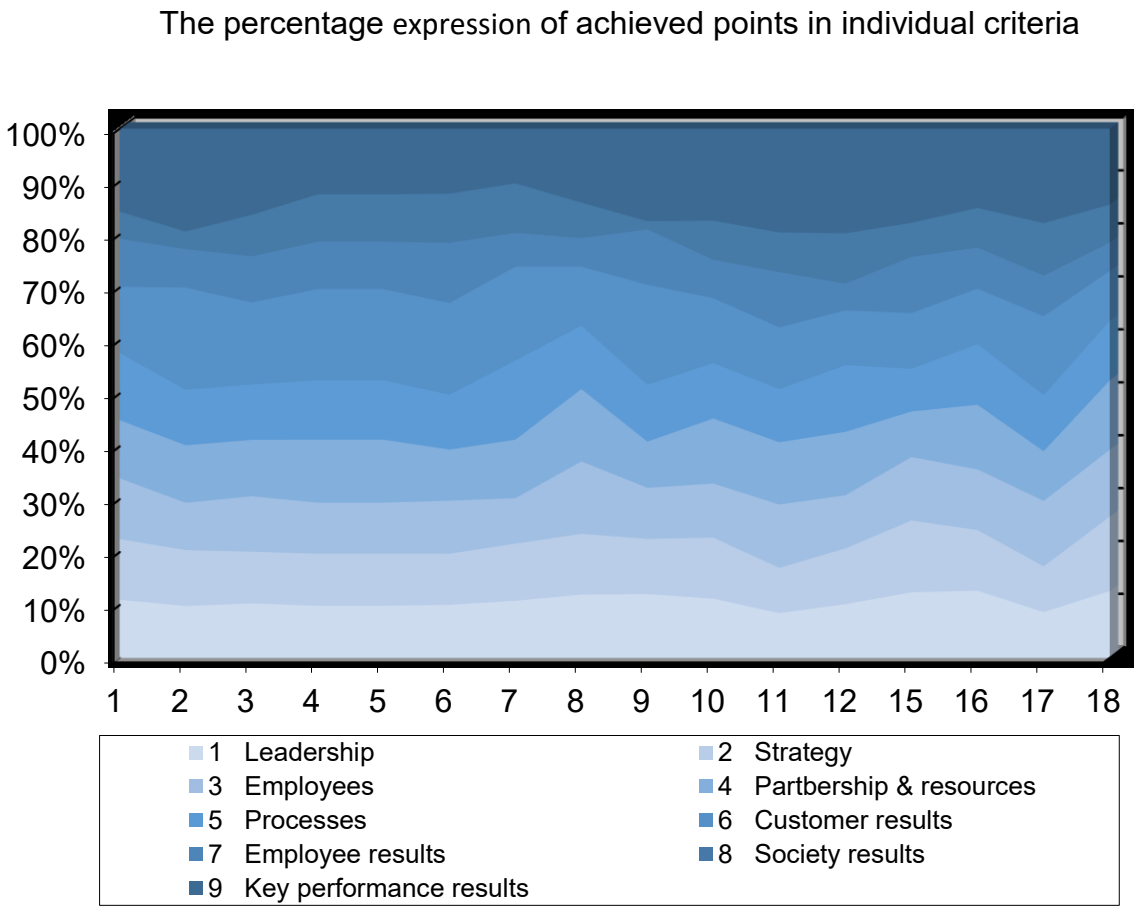

Figure. 5. Percentage expression of the number of achieved points in individual criteria

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On the Fig. 5 is possible to compare the individual evaluated organizations in all criteria and its individual proportions of evaluations between the individual criteria.

Evaluations have been carried out by an external evaluators. It also includes the identification of strengths and suggestions to improvement. Below are showed the key and most frequently identified strengths, as well as suggestions to improvement. Suggestions to improvement should be the basis for drawing up called improvement action plan.

Strengths of assumption criterion 3 - employees:

- Determination of organizational structure linked to the process management.
- The set structure of documents and records in human resources management (internal directives in field of human resources management, database of internal employees, work placement profiles personal employee card, appointment letters, employee evaluation sheets, register of responsibilities and competences).
- Human resources planning.
- The financial and non-financial system of remuneration and pricing, including records.
- The use of tests in selection procedures.
- The use of communication channels (intranet, e-learning).
- Existence of communication strategy creates conditions for the involvement of stakeholders into the development of organization.
- Existence of the concept of integrated communication creates conditions for effective communication of all selected communication channels regard to the target group.
- The use of satisfaction surveys of employees to improve their own approaches to communicate the principles of excellence and development plans of employees.
- Logical scheme of human resources management/activities of HR department.
- Education plan created on basis customer requirements, the organization as a whole and suggestions of superiors.
- Getting the feedback from employees through surveys.
- The development and use of vertical and horizontal communication.
- An extensive variety of communication tools and planning work meetings.
- A stable and transparent remuneration system that follow up on employee performance.
- A wide variety of support tools from the social program.
- An extensive support of social, cultural and sport activities for employees and their families.
- Motivational mechanism of financial and non-financial motivation for submitting implemented "proposal to improve".
- The creation of competency model.
- Respect and compliance with the organization Code of Ethics.
- Introduced system of evaluation and self-evaluations of employees.
- Mentoring and tutoring of new employees.
- Continuous improvement of the adaptation process of new employees.
- The effort to transferring good practices from abroad through educational trips for employees.
- Development of care plan for employees.
- The moral valuing of employees by management.
- Social, cultural and sport activities for employees and their family members.

Strengths of result criterion 7 - results in relation to employees:

- The developing activities in area of monitoring perception of employee satisfaction (e.g. satisfaction survey of employees).

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- Presented positive results in certain areas, for example increase in the number of employees, stabilized turnover rate, growing trend of survival.
- Regular review of the employee satisfaction set as a standard tool of feedback and evaluation of the appropriateness of the policy tools of HR.
- Improving the results between two organized surveys.
- Linking approaches, the cause and results of surveys as a consequence.
- Existence of objective indicators.
- A significant shift in motivation, information and communication between the years.
- Comprehensive measuring of employee perceptions through an extensive questionnaire.
- Appropriate structuring surveys.
- Suitable expression of results as equity indicators.
- Show a large number of results mostly as positive trend.
- Monitoring education effectiveness.

Proposals to improve the criterion 3

- A clear definition of the differences in the management of permanent employees and the part-time employees.
- Presentation of solutions of suggestions from employees, alternatively from the black box.
- Presentation of examples of using the feedback in relation to employees (e.g. from audits, meetings, satisfaction surveys, etc.).
- Linking the efficiency, productivity and profitability of work to evaluation of employees.
- Development of e-learning activities of the company in accordance with the communication strategy and HR development strategy.
- Knowledge management as a further potential development of an organization towards excellence - indication in the form of project sharing knowledge, position of manager to knowledge management.
- Care of employees has a wide scope in that is not entirely clear its connection to the concept of HR management and strategy as such.
- Analysis of communication needs for the development of the communication policy and strategy as part of the strategy of human resource management.
- Existence of a comprehensive strategy of human resources development instead of a partial documents.
- Description of mentoring and tutoring for new employees/career development/adaptation process.
- Systemic identification of employee knowledge.
- Description of the authorized members of employees and mechanism of leader substitute to performance and solve activities (the provision of competences).
- Identifying communication needs of employees.
- Designing a comprehensive communication policy/strategy (e.g. internal communication strategy).
- Description of the exchange of experience, knowledge and findings among employees.
- Improving of the use of unit/proportional indicators of performance against cumulative.
- The creation of learning plan based on customer requirements, the organization as a whole and suggestions superiors.
- Linking the training plan to the budge, needs, claims of stakeholders and laws.
- Description of teamwork (vertical and horizontal) and development of team skills.
- A more detailed description of the social agenda and scope of support.
- Performing regular analysis of the needs of human resources.

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- Include the terms and conditions of career progression in human resources management and its use to motivate employees.
- Developing a training plan according to employee category and according to type of education (categorized in IP human resources management - A to H) and following the personal development plans.
- Showing the managers evaluation by employees.
- Evaluation of employee satisfaction with the level of communication in the organization.
- Evaluation of the effectiveness of resources spent on education (budget/employee/errors).

Proposals to improve the criterion 7:

- Monitoring of the perception and satisfaction of employees and showing their performance by using the full width of the monitoring possibilities (see description of the model 7a, 7b).
- Seeking and finding an appropriate combination of the methods of monitoring with regard to the feasibility of obtaining relevant data and information value.
- Determination of key criteria and indicators for monitoring the results in relation to employees.
- Presentation of own objectives and trends of reported results.
- Define basis performance indicators in the area of human resources and targeted and consistent tracking of these indicators in relation to HR policy.
- Use benchmarking with the best in a similar group or at least with a diameter within the group to most of results (also internal).
- Tracking trends in satisfaction and performance.
- Use a mutual comparisons of development of operational results and planned objectives of ensuring interpretability development trends.
- Seeking for ways of increasing return of filled up questionnaires.
- Propose measures to prevent decline in satisfaction.
- Few of relevant performance indicators in relation to employees.
- Monitoring of performance as remuneration, turnover, innovatory suggestions, absenteeism, use of the social fund, evaluation of the training cost, implementation of the plan of education etc.
- Insufficient range of data in terms of time coverage that do not permit a reliable medium-term trend.
- Planning of the operational objectives to all results.
- Monitoring the level and form of benefits for employees and its regularly reviewed.

Conclusion

Any organization cannot function without human factor and of course cannot even build any system. Involved, loyal and skilled employees are therefore an essential condition for the success of the organization and its sustainable development.
The total potential of employees can used to benefit of organization through common values, growing mutual trust and facilitating initiatives. It is important that critical organizational objectives and priorities as well as ways and means of its achieving have been accepted by all employees. Communication within the organization should ensure linkages and relationships between organization management, individual departments and employees themselves. Main objective is to engage the entire company in achieving envisaged objectives, strengthen internal integrity of the organization social system and work towards excellence.

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Category: original scientific paper

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Risk Evaluation of Production and Implementation of the Project

Abstract:

One of the key parts during the project cycle of the technical projects is also a risk evaluation of production and implementation of the project itself in all phases of the production. In this paper, we will examine the correlation of one of the risks (i.a. political risk) that are taken in consideration during risk analysis production and which are in direct correlation with the current status of country's development status in which the projects are conducted, specifically in this case of countries which are new members of EU.

Critical risk in that case is the policy and institutional aspects, including existing economic policies and development plans, organisation and management of services to be provided/developed by the project, as well as capacity and quality of the institutions involved.

Keywords:
risk evaluation; political risk; technical projects; approach from EU projects; Monte Carlo method

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Introduction

A major issue that occurs during preparation of large long term infrastructure projects is always a preparation of project documentation. If we are planning a long-term infrastructure project all risks have to be foreseen. In a country with a marginal economic growth all bigger infrastructure projects have to be partially funded by the EU. In those countries one of bigger risks is the possibility of changes in a strategical approach towards those projects due to inexistent and incoherent national long-term development strategy. Standard approach in projects funded by the EU consists of two elements. First element is based on methodology of risk analysis which is described in a CBA guide 2014, issued by the EU. Second element is an international project experience of the Consultant in a project cycle. CBA is an analytical tool to be used to appraise an investment decision in order to assess the welfare change attributable to it and, in so doing, the contribution to EU cohesion policy objectives. The purpose of CBA is to facilitate a more efficient allocation of resources, demonstrating the convenience for society of a particular intervention rather than possible alternatives. Risk analysis within EU is defined as an assessment of probability leading to changes in variables or tasks that may occur [1]. By assigning an appropriate distribution of probability to the critical variables, distribution of probability for performance indicators can be estimated if applicable. The risk analysis is done in order to assess potential impacts of risks on the project respectively the planed measures. In general, the standard approach is applied as follows:

Risk analysis is done in 5 steps.

Step 1: A list of risks will be elaborated. That list will be prepared including most relevant risks for projects focusing on implementation.

Step 2: For each risk estimate the probability for occurrence of the risk (high - medium - low) and the description of the potential events leading to it will be assessed and described. This should be done by a panel of experts knowing the project and market conditions.

Step 3: For each risk estimate the potential impact on project performance (significant - medium - insignificant) and the description in which way the risk would affect the project performance will be assessed and described (panel assessment). In fact, the impact on delay and cost will be mentioned in order to use that for an overall impact the cost estimation and project schedule. This should be done by a panel of experts knowing the project and market conditions.

Step 4: The next point includes the preparation of a risk matrix and identification of critical risks (= medium or high probability for occurrence AND medium or significant impact).

	LoLow riskw			
	Important risk, risk should be monitored	Probability		
	Critical risks, mitigation measures needed	Low	Medium	High
Impact	Insignificant			
	Medium			
	Significant			

Table 1. Impact/probability table

Step 5: The final step includes the quantitative risk analysis (Monte Carlo simulation) of only critical risks (if applicable respectively assessment of the risk and data availability), subject to data availability. Panel estimated probability for risk occurrence includes possible ranges of risks (expected, minimum and maximum

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possible values) which mean triangle probability distribution is applied.

Finally, a mitigation measures will be described and recommend for selected critical risk but also for the determined important risks in order to handle the probability and impact depending on the overall results [2].

Risk analysis preparation

The risk preparation deals with the description of the risks, the assessment and final prioritization of the risks [3].

List of risks

The main risks that are relevant for the further analysis using the partition as follows:

- Political, legal and administrative risk
- Technical (including design and construction) and operational risks
- Financial risks
- Social and cultural risk
- Environmental risk

In this paper authors will emphasize the relation of political, legal and administrative risks on technical projects.

Political, legal and administrative risks

No.	Risk	Description
1.1	Missing the target - implementing of project main goals	Delay in implementing of project main goals leads to impacts on the connected project in EU. To be expressed in month of delays.
1.2	Missing the target - implementing of project main tasks	Delay in implementing project main tasks leads to impacts on the connected project in EU. To be expressed in losses of revenues.
1.3	Missing the target- Increase of competitiveness of project	Delay in implementing project main goals and tasks leads to impacts on the connected project in EU. To be expressed in losses of revenues.
1.4	Change of strategy of project	Can cause changes in design phases and losses of already invested funds. To be expressed in monetary terms and months of delays.
1.5	Main project supplier's contract	Negotiation and signing of the contract (selection of supplier) can cause changes in project start and roll out, selection of supplier contract negotiation. To be expressed in in months of delays.
1.6	Contractor's bankruptcy (supplier)	Can cause new tendering procedures and negotiation of contracts. To be expressed in monetary terms and months of delays.
1.7	Technical allocation	Approval by the national applicable law authority. To be expressed in monetary terms months of delays.
1.8	Delays related to project goal implementation	Implementation of the technologies requires information and coordination procedures with operators of neighbouring states in depending on their technologies. To be expressed in months of delays.
1.9	Service Level Agreement (SLA) with the supplier (not signed)	SLA (defined service level) must be agreed in order to avoid additional costs within operation. To be expressed in monetary terms.
1.10	Spare part management / contract	Regulations according to the spare part handling (supplier) has to be defined and agreed (contract, negotiation, specification). To be expressed in monetary terms.

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1.11	Contracts for project implementers	Permission according to communication in the neighbouring states is necessary for starting operations. To be expressed in months of delays.
1.12.	Analysis after project implementation	Future development may be different than forecasted. To be expressed in % foreseen.

Table 2. Risk description - political, legal and administrative risks

Risk matrix

The risk matrix, as shown below, illustrates the assessment of the risks that have already been described. The assessment includes the probability, the impact and the type of impact.

	Risk	Probability (high- medium-low)	Impact (significant-medium-insignificant)	Type of impact (costs-delay)	Description
1	**Political, legal and administrative risk**				
1.1	Missing the target - implementing of project main goals	Low	Significant	Delay	The planned measures and implementation on the project main goals change due political decisions as soon as the project implementation reaches the major target.
1.2	Missing the target - implementing of project main tasks	Low	Significant	Revenues	The planned measures and implementation on the project main goals change due political decisions as soon as the project implementation reaches the major target.
1.3	Missing the target- Increase of competiveness of project	Low	Significant	Revenues	The planned increase of competiveness on the project main tasks change due political decision as soon as the project implementation reaches the major target.
1.4	**Change of strategy of project**	**High**	**Significant**	**Delay & Costs**	**Current strategy of project is defined due previously defined main goals and main tasks. The implementation strategy has not yet been finalized and approved.**

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	Risk	Probability (high- medium-low)	Impact (significant-medium-insignificant)	Type of impact (costs-delay)	Description
1.5	Main project supplier's contract	Low	Medium	Delay	Study phase is ongoing and further planning phases will detail the specification, tender process and contract negotiation
1.6	Contractor's bankruptcy (supplier)	Low	Medium	Delay & Costs	Economical (strong) suppliers are mostly responsible for systems. The tender procedure should reflect on economic and technical capability of the supplier.
1.7	Technical allocation	Low	Significant	Delay & Costs	The application (inquiry) should be started immediately in order to consider times of the authorities. In general, (EU), it should be no problem. In some cases, costs could accrue. If that could not be handled the infrastructure and equipment could not be commissioned.
1.8	Delays related to project goal implementation	Low	Medium	Delay	Information and coordination procedure must be implemented with neighboring countries. (EU benchmarks are available).
1.9	Service Level Agreement (SLA) with the supplier (not signed)	Low	Significant	Delay	The task should be considered before operation and awareness must be taken because other supplier will not solve problems with the systems. Agreement could be prepared on the basis of experiences. SLA could be negotiated and contracted (standard).
1.10	Spare part management / contract	Low	Medium	Delay	This is part of the tender documents and must be clarified before in order to keep

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	Risk	Probability (high- medium-low)	Impact (significant-medium-insignificant)	Type of impact (costs-delay)	Description
					the system running during operation (decrease in availability).
1.11	contracts for project implementers	Low	Insignificant	Delay	The coordination with neighbouring states needs to be done (EU standards, and experiences are available).
1.12	Analysis after project implementation	Medium	Insignificant	%foreseen results	Moderate growth rates forecasted and the foreseen result is partly declining. The project implementation focuses on international projects.

Table 3. Risk matrix

The risk analysis will only consider the highlighted measures of the highlighted option. The qualitative risk analysis (as initial preparation) is reflecting the stage of the project development cycle at which project is currently in: study preparation is ongoing, design has not yet been started, and works are not yet tendered. That analysis could also be done for further project phases as design or tendering [4]. The risk analysis excludes the current projects that under preparation (different phases of realization) and focuses on the overall preparation [5].

Prioritization

The prioritization can be separated as follows considering the two categories:

On the basis of the risk matrix and their assessment the prioritization is prepared as shown below [6], [7]. The prioritization includes the two categories "critical risk" and "important risk".

- Critical risks, mitigation measures needed
- Important risk, risk should be monitored and

The critical risks are summarized as follows:

- Change of strategy due political changes
- Inadequate construction cost estimate
- Lack of national finance

The risks that need to be monitored are summarized as follows:

- Missing the target - Improvement foreseen by project main tasks and goals
- Service Level Agreement (SLA) is not signed
- Inadequate site surveys and investigation
- Change in requirements
- Operational migration
- Failure existing technology
- Lack of information to technical requirements in tender documentation
- Lack of EU finance (funding)
- Inadequate supervision cost estimates
- Cost overruns during construction
- Risk prevention and mitigation

The further on report deals with risk prevention and mitigation according to he defined critical risks as well as risk that should be monitored [8].

Critical risks

Risk	Prevention and / or mitigation	Timing (short, medium, long)	Residual risk (in comparison to risk matrix)	
			Probability	Impact
Change of strategy	The project strategy implementation must be defined. Function in charge: state	Short	Medium	Significant
Lack of national finance	The national co-financing (EU funding plus national funding) must be clarified and agreed. A strategy for using (innovative) alternative financial instruments should be developed (e.g. EIB loan). Function in charge: investor, ministry	Medium	Medium	Significant
Inadequate construction cost estimation	The planning phase and further required investigations must be started on the basis of the agreed strategy. Function in charge: investor	Medium	Medium	Significant

Table 4. Risk prevention / mitigation - critical risks

Risk	Prevention and / or mitigation	Timing	Residual risk (in comparison to risk matrix)	
		(short, medium, long)	Probability	Impact
Missing the target - implementing of project main goals/tasks	The project must be implemented (promote) as fast as possible for reaching the target focus. The design phase and needed investigation must be set up. Function in charge: state, investor	Short	Low	Medium
Service Level Agreement (SLA) with the supplier (not signed)	The task should be considered / negotiated before operation. SLA could be negotiated and contracted (standard). Project experiences are available in other countries Function in charge: investor			
		Short	Low	Medium
Inadequate site surveys and investigation	The planning phases have to be started and supported by further required surveys and investigations. Function in charge: investor	Long	Low	Medium
Chance in requirements	The requirements must be detailed as soon as possible. Firstly, the general conditions e.g. technical level and step by step detailed due to the ongoing planning process. The requirements are based on the decision according to the strategy. Function in charge: investor			
Operational migration	The required interfaces must be investigated and defined (survey, study). Function in charge: investor	Medium	Low	Medium
Failure existing technology	The interfaces and the existing technology must be monitored and maintained (preventive maintenance). Function in charge: investor	Short	Low	Medium
Lack of information to technical requirements in tender documentation	The technical documentations (design) need to be on a required level and the tender document must be written by experienced experts / on the basis of the already prepared projects. The know-how	Short	Low	Medium

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Risk	Prevention and / or mitigation	Timing	Residual risk (in comparison to risk matrix)	
		(short, medium, long)	Probability	Impact
	according to the technology has to be ensured and tender specification defined. Function in charge: investor			
		Long	Low	Medium
Lack of EU finance (funding)	The preparation of the project application must be started early. EU financial technical assistance must be involved early in the project cycle to reduce time for project approval. Function in charge: state, ministry, investor	Long	Low	Insignificant
Inadequate supervision cost estimates	The supervision costs should be extended on a basis of project experiences (national / international). Function in charge: state, ministry, investor			
Cost overruns during construction	The preparation phase must be detailed with surveys, investigation and planning's. Experienced (local / international) experts must supervise the projects during and the contract with the suppliers must be under consideration. Investment cost estimates should be compared well with costs experienced with similar projects implemented in the EU in the last years. Consultations with plant and equipment manufacturers were carried out to crosscheck estimates with current market conditions. Function in charge: state, ministry, investor	Short	Low	Medium
		Long	Low	Medium
		Long	Low	Medium

Table 5. Risk prevention / mitigation - monitored risks

Results of the risk analysis (critical risks)

The risk prevention / mitigation in the last chapter show measures for the critical risks which leads changes in their assessment. Anyhow, the risks are further critical and must be considered in a quantitative analysis. The overall risk assessment is finished here by discussing the contingencies in relation to the probability of overrun / underrun the cost estimate for the implementation of project strategy [9], [10] (without design costs).

Firstly, the probability distributions of the selected critical risks have to be determined. Afterwards, the Monte Carlo method will be applied for analysing the overall cost estimate. Finally, the potential amount of contingency will be discussed by applying and illustrating the statistical results.

In general, the risk analysis including the Monte-Carlo method should give an understanding of overrunning (or underrunning) of the cost estimate (point estimate) by using a probability distribution for critical variables and illustrating the probability distribution of the overall project costs as well. In making so, the accuracy of the cost estimate can be illustrated by using a certain statistical interval of confidence.

Probability distribution

The probability distribution of the selected variables will firstly be determined. As already mentioned the distribution based on expert discussions and apply a triangle distribution for each variable, due to the missing data from the past. So, the minimum and the maximum of the variables have been determined in discussions with experts [11].

The following table presents the variables and the established distribution. After specifying the distribution of the variables, the Monte-Carlo method have been run (n = 4,000).

Risk		Minimum	Expected	Maximum
Category				
Political, legal and administrative risk	Chance of strategy [month]	0	6	12
Financial risks	Lack of national finance [month]	0	6	12
	Inadequate construction cost estimate [mEUR]	90	100	130

Table 6. Quantitative risk analysis - probability distribution (triangle distribution)

One month delay amounts to 150,000 EUR in the consideration (assumption by the Consultant on the basis of project experience).

The figure below presents the results in form of a probability distribution and a cumulative distribution of the cost estimate after the Monte-Carlo analysis. This first result doesn't include a number of contingencies.

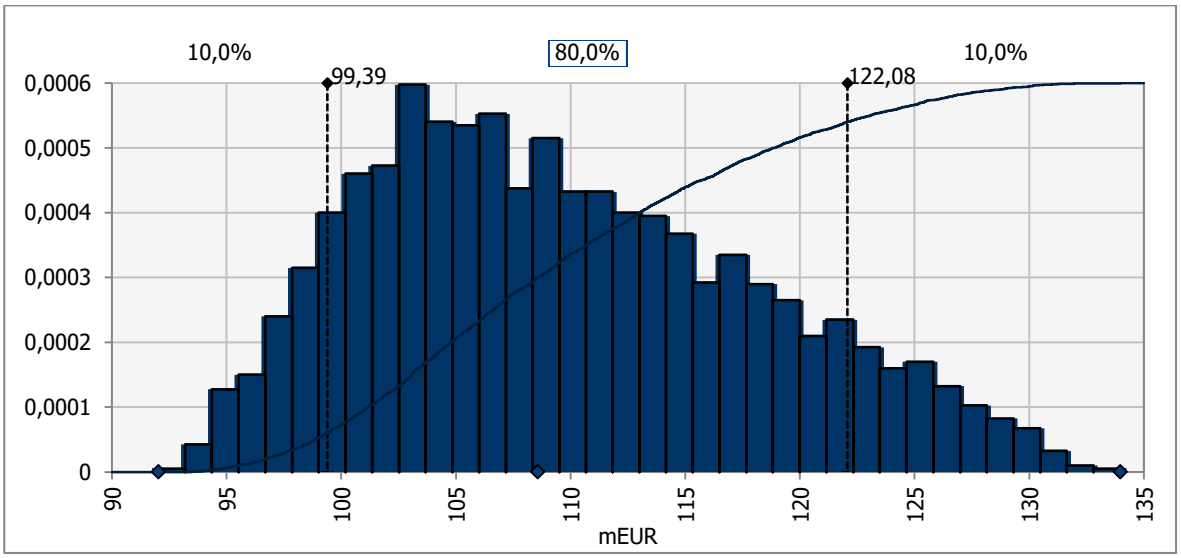

Figure 1. Quantitative analysis - probability of cost estimate (technical project) and cumulative probability (without contingencies), 80 % confidence

The value represents the point estimate of the consideration and amounts to 100 m EUR. In the case of 80 % confidence level the estimate ranges between 99 m EUR and 122 m EUR. This implies, the accuracy range (without contingencies) amounts to -1 % to 22 %. After describing the case without contingencies, the consideration will be extended to the case including contingencies. The recommended level of the contingencies depends on the assumed probability of overrun as well as underrun of the point estimate among other things. The table below presents a comparison of different estimate accuracies for several probabilities of overrun as 50 %, 30 %, 20 % as well as 10 %.

Probability of overrun	Base Cost m EUR	Contingency		Total Cost m EUR	Accuracy (80% confidence)
		Amount MEUR	%		
50 %	100	8	8	108	-9 % to 13 %
30 %	100	11	11	114	-15 % to 7 %
20 %	100	18	18	118	-22 % to 3 %
10 %	100	22	22	122	-23 % to 0 %

Table 7. Quantitative analysis - Determination of the contingencies and the accuracy in depending on the probability of overrun

The chosen contingency during the estimation of the CAPEX amounts to 25 %. The current analysis has shown that in the case of a probability of overrunning of 10 % (80 % confidence) the contingency is recommended with an amount of 22 %. This implies, the selected contingency covers the uncertainties considering the assumptions and explanations.

Conclusion

The presented analysis shows correlations and, between other risks, the risk of changing political

situations in correlation with financial risks. In cases of technical projects, especially those whom are related to long-term infrastructural investments, the risk of changing the main goals of the project due to unstable and incoherent national strategical development strategies is humongous. For that reason, this type of risk evaluation has a great impact on foreseen results. In phases of project preparation risk evaluation is the most important step in order to have a clear view of a situation. In countries, which are new members of the EU the planning of big long-term technical infrastructure projects is very delicate due to above described risks. It is extremely important to do a competent risk evaluation before closing the financial part of the project funded by the EU. [12]. Cost Benefit Analysis (CBA) is explicitly required, among other elements, as a basis for decision making on the co-financing of major projects included in operational programmes (OPs) of the European Regional Development Fund (ERDF) and the Cohesion Fund. Those funds are critical for financing long-term infrastructure projects. In conclusion, the analysis described in this article allows for the selection of projects not only on the basis of the best estimation, but also based on the risk associated with it, simply by weighing the performance with the risk [13].The expected performance, and not the modal one, is the value that should be reported in the application form for major projects requiring EU assistance, whenever a probabilistic risk analysis is carried out. In order to evaluate the result, one very important aspect is the compromise to be made between high-risk projects with high social benefits on the one hand, and low-risk projects with low social benefits on the other.

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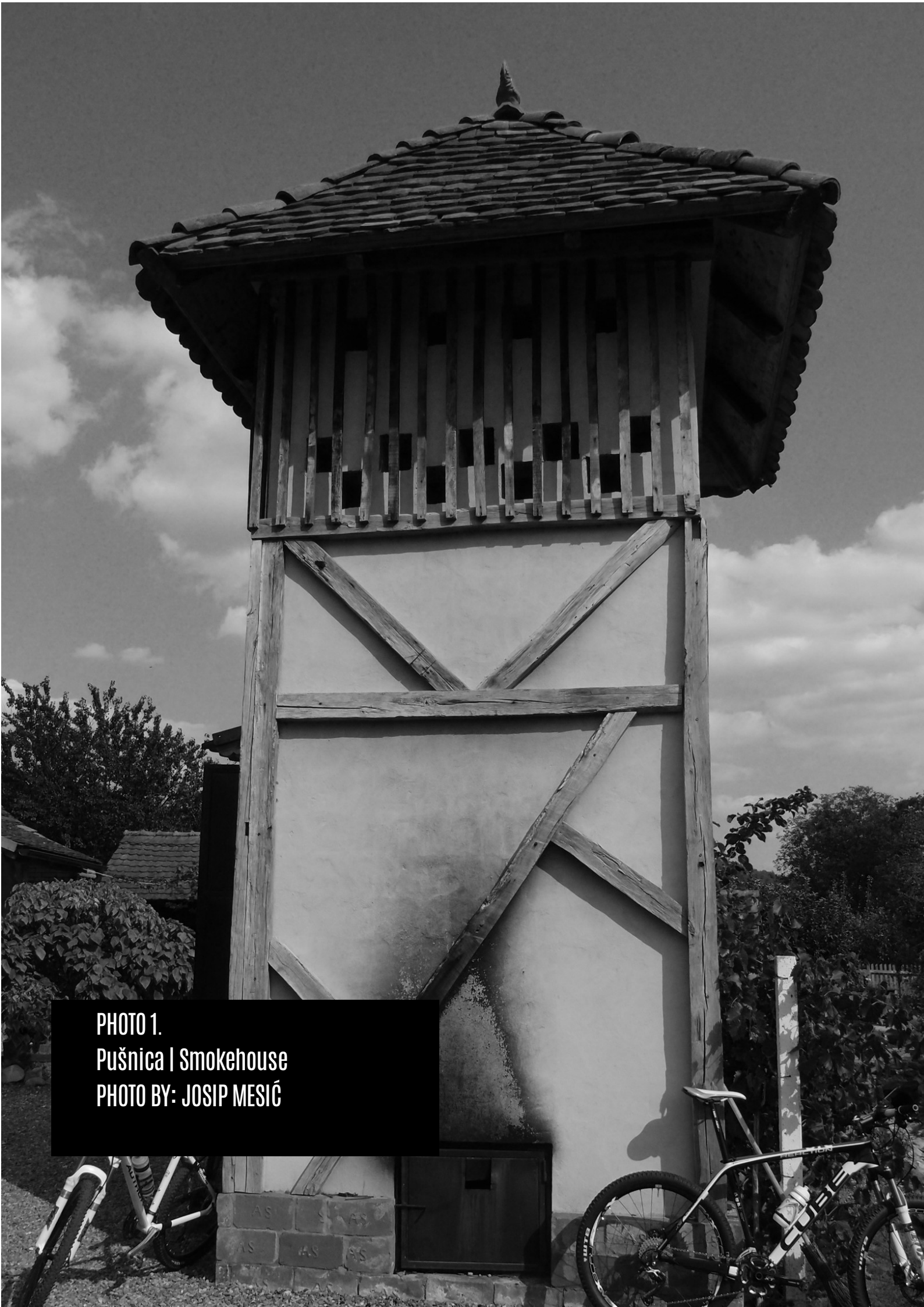

PHOTO 1.
Pušnica | Smokehouse
PHOTO BY: JOSIP MESIĆ

Category: preliminary communication

Hunjet Anica [1]
Vuk Silvija [2]

The Psychological Impact of Colors in Marketing

Abstract:

The Psychology of color is a scientific discipline that studies the different emotional states, behavior and mood in humans, caused by the color action. Color as a valuable tool and an integral part of marketing communication directly affects our subconscious and attracts or rejects us with its hidden meaning. It is therefore very important to choose the right color which achieves communication with the consumer. Since the market is flooded with various products full of marketing messages, it is essential to make our product distinguish from the crowd.

Marketing experts affect consumer behavior with integrated marketing communication through various market research. Better position of a product in the market and increased profits, can be achieved by proper selection and combination of colors. The survey and statistical analysis of the data were conducted by using descriptive statistics.

Keywords:

psychological impact of colors; colors and marketing; integrated marketing communication; advertising

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Introduction

Colors dominate our lives and surround us. The meaning of colors for people begins with the birth and follows us throughout our lives.

The psychology of colors investigates colors and corresponding impact on people. Various research confirmed that people perceive colors differently. Colors have positive and negative meanings; therefore, it is important to choose a certain color for a certain situation. If a goal were to influence the on-line purchase decision, it would be wise to use red color on the corresponding web site. Namely, red triggers action and can therefore influence consumer-s behavior.

Color is a valuable tool, integral part of the marketing communication that sends a powerful message to consumers. The purpose of colors in marketing communication is to attract people-s attention and stay in conscious as long as possible. It is also very important to know for whom the product is intended. Marketing experts are familiar with the psychological influence of colors and corresponding influence on (our) subconscious consumer mechanisms. Approximately 90% of current, subconscious products judgments are based on colors [1]. Research showed that certain product purchase decisions are made within 90 seconds of product observation [1]. Due to the mentioned, marketing experts make us buy certain products by carefully choosing and combining colors while creating consumer behavior at the same time.

Marketing experts are very often misusing children vulnerability and their receptivity to adverts, while promoting certain products. Namely, majority of companies use popular cartoon characters in advertisements in order to attract children-s attention and influence their behavior. Marketing experts learned through time to think as children and to "approach" them the right way. In advertising various products for children, characters from cartoon Frozen are currently being used the most. The mentioned has a very strong influence on children and (enhances) creates the necessity for the product. Color is also one of the key factors in packaging design. In order to improve sales, marketing experts have to carefully set the target group of consumers when the sell a certain product. Furthermore, it is also very important to take into consideration psychological meaning of a certain color and its impact on people.

Psychological meaning of colors

Color directly affects our subconscious, it attracts or rejects us. From a psychological point of view, a certain color has a different influence on each person, causing different emotional states, behaviors and moods. Close connection of colors to our psychological state tells much about ourselves. Some colors are accepted and desirable in different cultures while others are undesirable due to causing negative feelings or events. With their hidden meaning, colors convey a universal message that is above all racial, religious or sexual limitations [1,2].

The history of the psychology of colors

Long-term research show that color perception defers among people, influences emotional state, behavior and mood.

Aristotle was one of the founders of the theory of color perception in the fourth century B.C. He connected basic elements of fire, water, earth and air with certain colors. Aristotle-s principles of defining colors were used for two thousand years until the general theory of colors was set by Newton [3,4].

Hippocrates, for example, discovered that light red could have different impact on people compared to dark red. According to Hippocrates- theory, the impact of light and dark colors is different. By concluding that colors could be used

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therapeutically, he set the basics of modern medicine. Combining power of colors, music and plants Paracelsus "renewed" philosophy of colors and used it in healing [5].

Sir Isaac Newton set the theory of colors in 1672. According to Newton, colors are related to light. In his experiment, Newton noticed that by releasing white light through optical prism light brakes to components [6]. White light, heterogenic mixture of various types of beams decomposes into differently colored beams called "color spectrum" by breaking in a prism. Every color in a spectrum is more or less breakable depending on position. The least breakable color in a spectrum is red with maximum wavelength [6]. White sunlight is the sum of all spectrum colors. Spectrum of colors consists of seven colors: red, orange, yellow, green, blue, indigo and purple. Every spectral color with a certain wavelength and color spectrum is continuous - from blue purple to orange. He described light as electromagnetic occurrence, while first circle diagram was developed in 1666 [7,8].

Primary colors of the Newton system are red, yellow and blue. Their combination creates all other colors. Many scientists tried to dispute Newton-s theory, one of them being Johannes Wolfgang von Goethe. He claimed that white light should break whenever possible. By reflecting the white light on the wall of the room, there were different colors on the edges of the circle, and the light in the middle was white. Therefore, he concluded that color closest to the white is yellow and a color closer to the edge is blue. Leonardo da Vinci claimed that an eye absorbs the light, i.e. electromagnetic waves. The term light purports the occurrence, which allows us to see things that are around us.

Light is a narrow band of electromagnetic radiation visible to the human eye, caused by an electromagnetic field disorder. Electromagnetic radiation covers wide spectrum of energy but light is only part of the total spectrum to which our eye reacts. The wavelength of the visible part of the spectrum ranges from 380 to 750 nm. Human eye can see approximately 160 nuances of colors in the visible part of the spectrum [2,9]. Electromagnetic beams do not have limited wavelengths but tend to mix together, meaning that visible light may also contain some ultraviolet and infrared wavelengths.

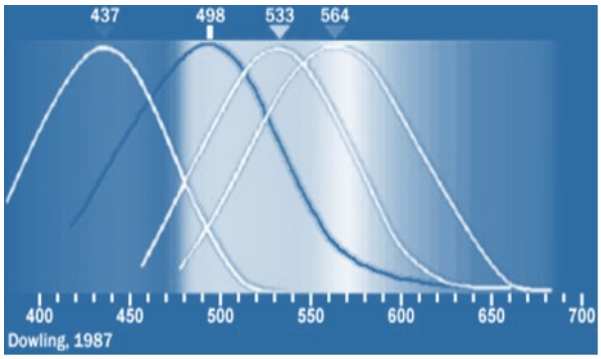

Figure 1. Eye sensitivity to colors [9]

The meaning of colors has been changing for centuries. The Celts used colors to describe the elements surrounding them and the Americans looked at colors as a basis for spirituality [1]. The color symbolism has been developing throughout history depending on different cultures and races. The basic anthropological colors of the Middle Ages of Western Europe found in all civilizations were white, red and black [10]. Colors were used for classification, labeling, differentiation, connecting and confrontation purposes [1,7]. In the Middle Ages appeared concepts such as intensity, density and color contrast. Colors have since 13th century been used for labeling individuals and certain social groups. Red was used for unbelieving Christians and the most noticeable color was yellow.

Colors And Marketing

Colors as an integral part of marketing communication

Color is a valuable tool and an integral part of marketing communication sending powerful message to consumers. Recent studies showed that

80% of information people remember relate to colors.

The meaning of colors for people begins with the birth and follows us throughout our lives. Vision is the most dominant and most developed sense with the greatest power to influence consumers-perception. Research showed that as much as 60% of a purchase decision for a given product is based on the correct color selection [11]. Colors create strong influence and cause reactions. Well-chosen color attracts attention, relaxes, while other color used in the same context can even irritate. As in every segment of life, likewise in marketing the first impression is very important therefore, color becomes an important factor of consumer communication.

Due to positive and negative meaning of colors, it is very important to choose the right colors while communicating with consumers. When launching new products, designers carefully choose colors to deliver a specific product message to customers. In addition to color choices, packaging design is also important and has to be appealing [12]. Therefore, it is very important to differentiate the products. Customer will always choose the product which is more appealing. Furthermore, a customer takes approximately from 1/20 to half a second to notice certain product. Research showed that buying decision is made within 90 seconds [1]. Due to the mentioned, it is important to choose a color which causes comfort. In such a short period, the brain perceives only pleasant colors and neglects others. Therefore, we should pay attention when buying products for quality or for packaging [13].

Integrated marketing communication

Integrated marketing communication (IMK) is a process of development and application of various types of persuasive communication with consumers and potential customers in a certain period. One of the main goals of integrated marketing communication is to direct the behavior of the selected audience. The process starts with a consumer or potential customer and returns to the goal of determining and defining the forms and methods through which a persuasive communication process will evolve.

Five basic characteristics of integrated marketing communication are [11]: influence behavior, start from consumer or potential customer, use of one or all communication types, achieve synergy effects and build long-term relationship with customers.

Consumer behavior and marketing

Consumer behavior represents the process of obtaining and consuming products, services and ideas from the consumer unit. It can be defined as the behavior that consumers show in various research, purchase, use and evaluation of products that should meet their needs. According to the American Marketing Association (AMA) definition, consumer behavior is defined as a dynamic interaction of knowledge and environment factors that result in behavior and exchange of aspects of consumer life [11].

In order to achieve success, the marketing strategy should be based on the comprehension of consumer behavior completely. The modern marketing definition says that "marketing is a human activity focused on meeting the needs and desires of the human exchange process." The consumer and the company have their goals in the process of exchange. The company's goal is to sell products under the most favorable conditions. On the other hand, the main goal of the consumer is to meet the needs and wishes in the best way. Given that the consumer society is constantly changing and developing, there is no marketing strategy that would be effective at any time for different products, markets and industries [13].

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Children and marketing

In marketing is important to know for whom the product is intended for. Research showed that small children like warm and strong colors like red, orange, yellow and magenta. When grown up, children become more disciplined and loose the sense for colors. Therefore, corporations "aim" for children as soon as they become aware their social environment. Children-s vulnerabilities and ads receptivity, "lack of resistance" to advertisements may be misused by marketing specialists [13]. Products to which brand labeling is the most addictive for children are ketchup, mayonnaise, coffee, headache, cosmetics, perfumes, beer and cigarettes.

Figure 2. Advertisement for chesterfield from the 1960-ies [14]

Children's advertisements are often indirect because they attract attention more easily. According to estimates, 90% of knowledge is based on information received by the media. Using popular characters and powerful messages reaches children's emotions, creating the need for the product. The ads determine which products are popular and which products children must have.

Figure 3. Using popular cartoon characters in advertising water Jana [15]

Marketing and brand labeling

Brand labeling is one of the biggest problems when it comes to color perception. Through various research and analysis, scientists tried to classify the reactions and responses of consumers to the use of different colors.

The study „The influence of colors in marketing" [16] shows that 90% of current, subconscious judgment on products is based on colors. Connection between brand labeling and colors depends on suitability of a color which is used for a certain brand labeling. It is crucial to match the color with brand labeling since it represents it in an adequate way. Purchase decision of a certain product greatly depends on colors. Namely, color influences the way a customer perceives "personality" of a certain brand labeling. It is more important to match a color with what brand labeling represents rather than to follow the meaning of that color. Green is used for environmental brands (Timberland G.R.E.E.N) but also by finance companies [13]. The feelings, moods and pictures representing brand labeling have the most important role in convincing the customer to purchase the product.

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Figure 4. Colors and brand labeling [16]

Colors in Advertising

Forms and goals of advertising

Advertising is a form of communication with a goal to inform a customer on products or services. Final goal of advertising is product sales and profit.

Goals of advertising [13]: stimulation of primary or selective consumption, advertisement of products or institutions, creation of direct or indirect effects, basic functions of advertising, communication function, sales function.

Colors and packaging

Packaging is one of the key factors when selling a product to a potential customer because it somehow hypnotizes and encourages for purchase. The color that produces the strongest effect is red, while attractive colors on a packaging are orange, blue, black, green, yellow, purple and gray. To improve sales, marketing experts have to carefully set the target group for whom the product is intended. If a particular product is for the younger population, it is recommended to use strong and clean colors. Unlike younger population who prefer strong and cheerful colors, middle- and middle-aged population prefer pastel colors. The cosmetic industry usually uses light blue and light green color for advertising face-care products. [1,8]

Key elements which should persuade customer to purchase a product: symbols and words of a certain product, illustrations and color.

By combining white packaging with different colors a range of different messages can be obtained. White packaging combined with red decoration attracts attention to the product and encourages excitement. On the other hand, if you want to advertise a fun product, a yellow decoration is used. Sophistication and prestige is achieved by using black decoration or printing [17].

Figure 5. Product in white packaging [18]

By using black packaging, the degree of secrecy, elegance, cost and value is achieved and by combining black packaging with any other color a strong message can be sent to potential customers. Furthermore, by combining black packaging with golden printing elegance and sophistication can be achieved. With the mentioned, our product attracts higher-income market.

If we want to attract women market, the combination we should use is black packaging with pink printing. Pink soothes the message we want to send. By adding brighter colors on the packaging, the seriousness is reduced [17].

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Figure 6. Product in black packaging [19]

Blue communicates confidence, strength, reliability and unity. If we want product to look more professional and serious, dark blue is used. Blue encourages relaxation and calmness. Younger population often associates it with mature people. Blue is the favorite color of both sexes and is therefore the safest color to use [17].

Figure 7. Product in blue packaging [20]

By using red on packaging, attention is drawn to the product, senses are stimulated and excitement is awoken at potential customer. Brighter nuances of red are more exciting and energetic and generally less perceived than darker nuances. Dark red is perceived as professional and luxurious color. Black printing on red packaging can add sexual connotations to the product [17].

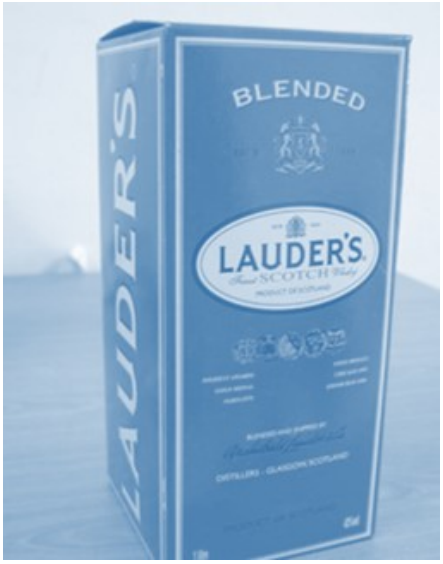

Figure 8. Product in red packaging [21]

Green is used in the packaging of natural, organic and healthy products. Green is the color of balance and harmony of mind, body and emotions. If elegance and sophistication are to be achieved, dark green color is used, which implies wealth, luxury and professional quality [17].

Figure 9. Product in green packaging [22]

Orange packaging of product indicates the availability of products, entertainment and adventure. When purchasing products in orange packaging the product can be of high quality and cheap or just cheap and of poor quality. By adding

black on orange packaging the perceived value of the product can be increased [17].

Figure 10. Product in orange packaging [23]

Yellow inspires originality and creativity. If yellow packaging is used, the product can imply originality and innovativeness or something cheap or fun. Products packed in yellow attract customer-s attention.

Figure 11. Product in yellow packaging [24]

Using turquoise is ideal for cleaning products packaging. It is also good for use in healthcare because it balances emotions and calms the spirit. The combination of turquoise with red gives rise to excitement and the combination of turquoise and pink gives confidence to the female population. If turquoise packaging is added to dark blue, conservatism is achieved.

Figure 12. Product in turquoise packaging [25]

The use of purple in packaging implies luxury, extravagance and top quality. Combining purple with different colors on packaging sends a certain message to potential customers. If we combine purple packaging with gold or silver prints, luxury, prestige and quality are achieved. By adding red color the excitement is achieved, and by adding magenta the liveliness is achieved.

Figure 13. Product in purple packaging [26]

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Reserach And Data Analysis

A survey on social networks [27] was conducted for the purpose of research in August 2016, involving 54 respondents of which 55.6% were women and 44.4% were men. The questionnaire consisted of 21 questions, where two questions related to demographic data and other 19 questions focused on the set research goal. The obtained data were analyzed by descriptive statistics. The majority of respondents were aged 18-40 (59.3%) and respondents of the age group younger than 18 years and older than 40 years responded to the questions in the same ratio (20.4%). The mentioned is a limitation of the research as it is a small sample.

When asked *"What is your favorite color?"*, majority of respondents chose blue and the color they prefer the least is yellow.

When asked „*What color is according to you the least noticeable?*", respondents chose red (57% of respondents), yellow (35% or respondents) and orange (more than 7%). Emotion that is usually associated with red is love and passion (70.4%) and with power the rarest (14.8%). Respondents were given the opportunity to give more answers to some of the questions, which was also the case.

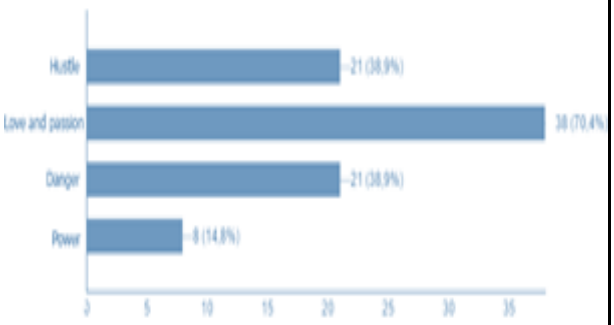

Figure 14. Emotions that respondents associate with red

Emotions that respondents associate with blue are trust (51.9%), wisdom (48.1%), formality (35.2%) and truth (24.1%).

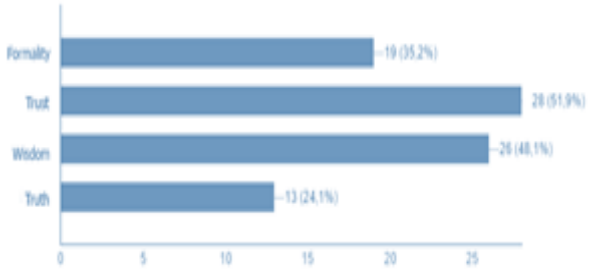

Figure 15. Emotions that respondents associate with blue.

Light is an emotion that repondents usually associate with yellow. Out of 54 respondents 35 or 64.8% chose yellow which represents the light, while the smallest number of repondents, 8 or 14.8% relates it with disturbance.

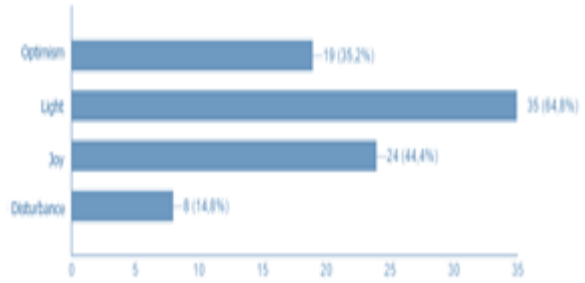

Figure 16. Emotions that respondents associate with yellow

Respondents usually associate green with freshness (64.8%).

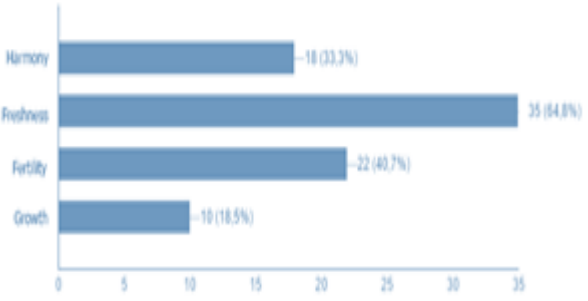

Figure 17. Emotions that respondents associate with green

When asked „*What is the importance of colors in advertising?*" and majority of respondents, 53.7%

stated that colors are important in advertising and 35.2% responded that they are very important in advertising.

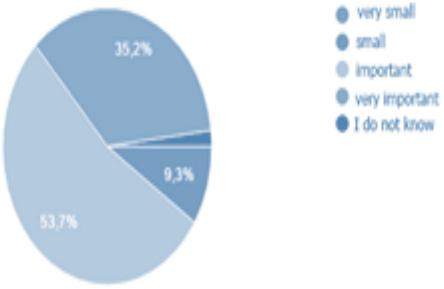

Figure 18. Importance of colors in advertising

When asked „*Do you think that color influences the purchase of a certain product?*, 90.7% of respondents disagreed.

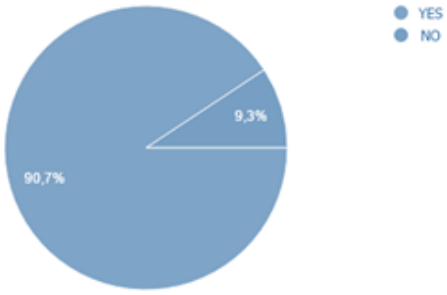

Figure 19. The influence of colors on certain product purchase

Psychology of colors has a great influence on food selection in stores. The colors are closely related to food and are one of the key factors in choosing food. Studies have shown that people do not want to eat certain food unless its color is different from what they expected. The colors are responsible for increasing or decreasing appetite in humans. By stimulating emotional reactions, red increases appetite more than any other color, and blue decreases it.

When asked „*What color decreases appetite?*“, 81.3% of respondents opted for blue, while 12.5% or respondents opted for red.

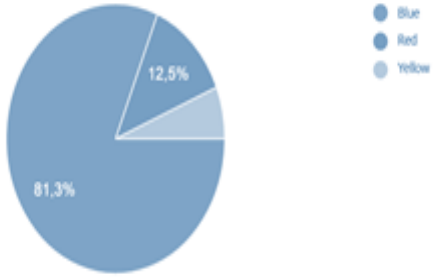

Figure 20. Colors reducing appetite

When asked „*Is color one of the key marketing factors?*“, more than 83% respondents agreed, while 11% stated that they do not know.

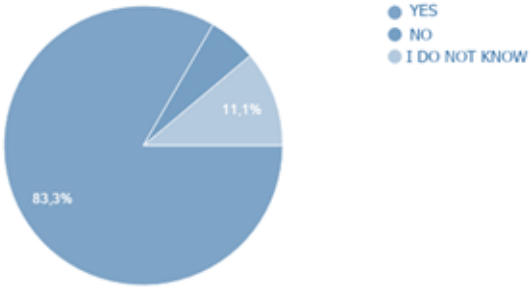

Figure 21. Color as a key marketing factor

When asked „*Do marketing experts and corporations negatively influence children with various advertisements?*“, more than 90% respondents agreed.

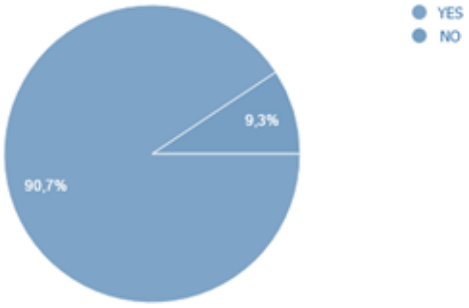

Figure 22.The influence of marketing on children

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When asked „*What is the decisive factor when purchasing a particular product?*“, 66.7% of the respondents answered that it was the packaging design, while the other respondents decided it was the price or quality of the product.

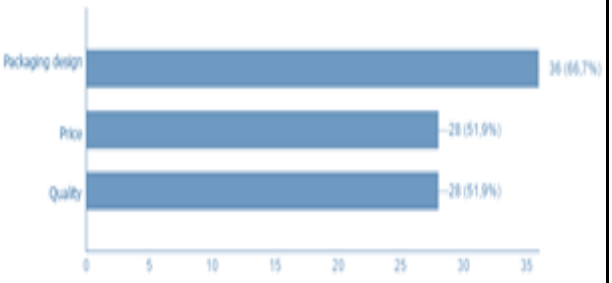

Figure 23. Decisive factor when purchasing a particular product

Conclusion

In this research authors came to the conclusion that color is one of the key elements of the whole marketing strategy dominating in marketing communication.

Marketing experts are very well acquainted with the psychological meaning of colors and their influence on consumers. With careful color selection in communication, product design and advertising a message that is based on the correct color selection reaches our "awareness" and creates the need to purchase a particular product. This leads to persuasion and ultimately to the desired behavior of the consumer.

In the survey conducted on 54 respondents it was concluded that blue is the color usually chosen by respondents and the color they prefer the least is yellow. Respondents answered that the most noticeable colors were red (57% of respondents), yellow (35% of respondents) and orange (more than 7% of respondents). The emotions that are most closely associated with red are love and passion (70.4%), while the emotions that are associated with blue are trust (51.9%), wisdom (48.1%), formality (35.2 %) and truth (24.1%). Light is the emotion most closely associated with yellow, 64.8% of respondents associate yellow with light. Green is usually associated with freshness (64.8%). 53.7% of the respondents answered that the colors are important in advertising and 35.2% of them responded that it is very important to use colors in advertising. 90.7% of respondents believe colors affect the choice when purchasing a particular product. By stimulating emotional reactions, red increases appetite more than any other color while blue reduces it and by research it is proven that 81.3% of respondents answered that blue reduces appetite. Most of the respondents, 83.3% believe color plays an important role in marketing and is one of the deciding factors in product selection. Research question "Do marketing experts and corporations negatively influence children with various advertisements?“ more than 90% of respondents answered positively. The deciding factor when purchasing a particular product is the packaging design. Respondents also agreed that marketing experts and corporations with various advertising create a negative impact on children.

Furthermore, research limitation is a small sample size.

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Inter-Organizational Collaboration for Innovation in Manufacturing Firms

Abstract:

From day to day, taking part in the collaboration process in different business aspects, especially in the innovation process continues to gain in importance. Innovation enables companies to strive for a more powerful market position, while inter-organizational cooperation is perceived as an efficient means of enhancement of firm innovativeness.

The purpose of this paper is to present the state of inter-organizational collaboration for innovation among manufacturing companies in Vojvodina, analyzing cooperation among manufacturing firms with different external parties, in different innovation areas. Furthermore, the aim is to examine the effects of inter-organizational collaboration on the innovativeness of manufacturing firms in Vojvodina. The data used in this paper was gathered within the international project European Manufacturing Survey.

The results are presented using descriptive statistics and they demonstrate that the existence and frequency of inter-organizational collaboration, although quite present, depends on external parties as potential cooperation partners and on different innovation areas in which collaboration could occur. Also, the research shows there is a notable relation between inter-organizational collaboration and firm innovativeness.

Keywords:

Inter-organizational collaboration; Cooperation; Manufacturing firms; Innovation; Innovativeness

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Introduction

In the present constant and dynamic changes in economic and technological conditions, inter-organizational collaboration appears as the industrial response [1]. In order to neutralize and cope with competition intensity and market heterogeneity, some companies decide to engage in joint cooperation with other firms and different organizations [2].

Various potential participants have different strategic objectives to take part in certain aspects of collaboration. Higher level of motivation in certain companies might be due to their perception of their capabilities and resources to perform various activities on their own. More specific, large companies can rely on their own resources, while small firms tend to acquire the necessary resources from the environment. However, albeit large organizations may have necessary resources, SMEs are often a fruitful source of innovative ideas and fresh perspectives. In practice, collaboration has shown many benefits for companies, especially in terms of innovation capacity building. However, not all organizations recognize the benefits of inter-organizational collaboration and cooperation, although the percentage of companies seeing collaboration as desirable is relatively high. This can be explained by varying organizational cultures, environmental climates and similar, influencing those differences in the understanding of the collaboration concept by different parties.

We do not have a clear understanding of how inter-organizational collaboration affects innovation in small regions such as Autonomous Province of Vojvodina. Thus, this paper deals with the collaboration concept in manufacturing companies in the territory of Vojvodina. Related to that, three research questions are defined:

- The first research question of this paper is to present the level of collaboration of manufacturing firms with other different external parties, in different areas of innovation.
- The second research target is to investigate the perception of manufacturing firms regarding the importance of different innovation areas.
- The last research target is to examine the connection between inter-firm cooperation and firm innovativeness, more precisely, to analyze whether more intensive inter-organizational cooperation in new product development activities, as well as in R&D activities, influences the higher firm innovativeness in terms of innovative products.

For this purpose, we adopted Danneels' [3] explanation of "firm innovativeness as the outcome of the innovation process, defined as the capacity of the firm to develop and introduce a new product or service" and Dietz & Becker's [4] view on innovation output of firms as indicated by new products. Although innovativeness could be also observed from a wider perspective (including new processes, technological concepts etc.), in this paper we used the previously described definition to investigate the existing connections between collaboration practice and innovativeness. The assumption was that a greater degree of collaboration in new product development and R&D activities results in greater innovative development capacity, specifically, new products introduction success.

The data used were gathered through the European Manufacturing Survey (EMS), covering the results from 2015 in the territory of Vojvodina where the Faculty of Technical Sciences in Novi Sad had carried out the EMS survey. The results are presented using descriptive statistics. To the extent of our knowledge, so far there are no recent studies directly addressing this perspective on the topic in Vojvodina. The results show that there is a high degree of collaboration between manufacturing companies in Vojvodina and external parties. Nonetheless, the results demonstrate that

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manufacturing companies collaborating more often with other organizations (companies and research institutions) in product innovation activities or R&D have introduced a noticeably higher percentage of new products to the company and new products to the market than the companies not engaged in inter-organizational collaboration.

The paper is structured as follows. The theoretical part briefly introduces the concept of collaboration and innovation. The methodological section explains the concept of EMS and describes the process of data gathering. The empirical section analyses the level and forms of collaboration of manufacturing firms with external parties and potential connection between inter-firm cooperation and firm innovativeness. Finally, the conclusion summarizes the findings with certain implications.

Collaboration and Innovation

In their paper [5] the authors define the concept of inter-organizational collaboration as a feature of the innovation process referring to the extent to which other organizations form an important part in the innovation process, where organizations can stand for firms or for institutions.

According to [6], innovation represents 'the implementation of new or significantly improved product, process, new marketing method, or a new organizational method in business practice, workplace organization or external relation'.

Nowadays, as the highest priority in achieving competitive advantage is innovation [7], collaboration with partners, customers and competitors has become strategic imperative for companies [8].

So far, many incentives for inter-company and inter-organizational collaboration have been pointed out by different researchers and practitioners. In terms of positive effects on firm innovativeness, collaborative linkages enable all parts to exploit the benefits of knowledge sharing, to benefit from complementary skills merged from different firms [9], to take advantages of scale economies in the research process, cost sharing and risk spreading [10], [11], [12]. Furthermore, cooperation results in faster product/service development and faster speed to market [13], [14].

One of the main aims of any firm is to maximize profits by using and improving its resources and capabilities [15]. Consequently, knowledge flows and exchange are becoming essential priorities for firms. One of the most effective ways to accomplish this and improve the learning process is to cooperate with external partners [12].

SMEs are prompt for the establishment of cooperative relationships with other companies to achieve market strength, or to exploit new opportunities [12]. This could not be possible to that extent due to their limited resources, both human and financial. Although SMEs may be well innovative, they often do not have the commercial strength or professionalism required to successfully exploit their innovative ideas [16]. Related to that, the success of an organization is not guaranteed only by the ability to understand and generated advanced knowledge, but also to transfer it into marketable innovation as well [17]. On the other hand, large companies are less interested in cooperation for innovation, due to the fact they possess the needed technical and financial capability [11]. However, in practice, there is significant evidence that the global market leaders recognize the necessity to find cooperation partners to design an innovative value chain, combining their own core competencies with those of other leading firms [18]. Fostering mutual trust as a basis of cooperation, companies are able to exchange resources and key competences to

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achieve the goals unreachable when acting individually [19].

The decision to cooperate in innovation is significantly driven by the fact that cooperation is seen as an efficient way to enhance the probability of innovation project success [20], [4]. This is in direct relation to the belief that the implementation of additional external capacities raises the level of innovation output [4]. Nonetheless, analyses of the effect of cooperation demonstrate that, on average, cooperative firms have higher overall performance levels than non-cooperative ones [4] as well as higher R&D intensity [21].

Research methodology

The research methodology used was a survey research. Specifically, data was collected through The European Manufacturing Survey (EMS), coordinated by the Fraunhofer Institute for Systems and Innovation Research - ISI. EMS represents the largest European survey of manufacturing activities whose extensive questionnaire covers questions generally referring to organizational concepts, collaboration for innovation, cooperation issues, the application of advanced technologies and innovative concepts, project management, performance indicators and others. The main focus of the survey is the development and utilization of different types of innovations by companies in the manufacturing industries, and associated performance effects. In 2001, researchers at ISI took the initiative to make an international survey, aiming to gather internationally comparable data by means of a standardized method and core questionnaire that was carefully translated into each participating country's local language. Since then, the survey has been conducted every three years, constantly expanding the range of participating countries. So far, five multinational survey rounds have been carried out with about 3-year intervals while the sixth round is under way (2015/2016).

Our research was based on EMS data from the Serbian (territory of Vojvodina) subsample from the year 2015. The responding companies were from the manufacturing sector, having at least 20 employees. The total number of companies meeting the requirements in Vojvodina is 600. However, in order to ensure a representative sample of companies equally distributed by different industries and counties, 334 questionnaires had been sent, 123 of which were returned (36.8% response rate). Data gathering was performed by the Faculty of Technical Sciences in Novi Sad, firstly through the pre-test phase and two phases of mass distribution.

The information asked for and analyzed concerns the following:

- Existence of collaboration with external parties (suppliers, competitors, service organization and research centers and universities) in specific innovation areas (new products, new technical processes, new product related services and new organizational concepts).
- Cooperation in R&D with other organizations (suppliers, competitors, service organization and research centers and universities).
- New product development.
- Relevance of different innovation areas for manufacturing companies.

All questions were carefully translated from the original sample and adjusted to the specificities of the territory where the survey was conducted. An example of one question related to the main sources of innovative ideas for manufacturing companies in Vojvodina is presented in figure 1.

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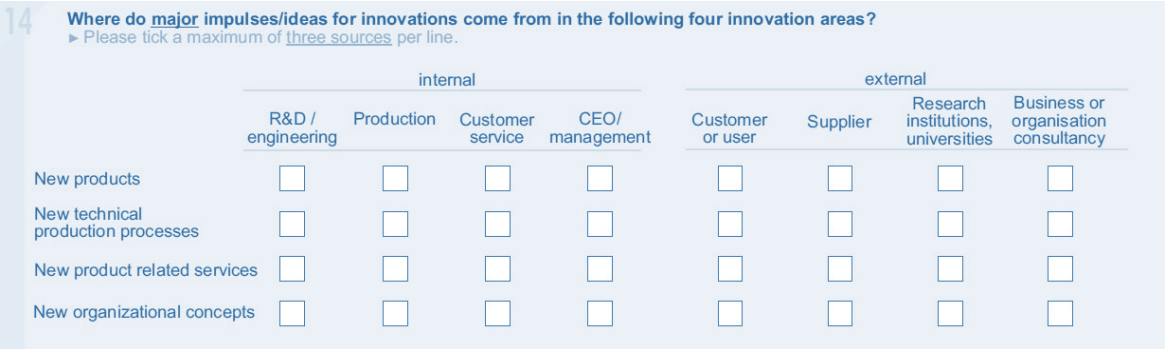

Figure 1. Question on innovation process in EMS 2015.

Results

For the purpose of testing research questions, descriptive statistics was conducted by IBM SPSS.

Inter-organizational cooperation in specific innovation areas

Firstly, the percentage of companies that collaborate with other organizations or parties in specific innovation areas is analyzed and presented. The defined areas of innovation in this survey are: new products, new technical production processes, new product related services and new organizational concepts. Following, figure 2 shows the percentage of manufacturing companies in Vojvodina according to the external party they cooperate with in specific innovation areas, those parties being: customers, suppliers, competitors, service organizations (business or organization consultancy) and research institutions and universities. Finally, the frequency of collaboration is presented in figure 3.

Table 1 presents the percentage of Vojvodina's manufacturing companies that cooperate with external organizations in specific innovation areas.

Innovation area	Share	Rank
New products	69.1%	1
New technical production process	58.5%	2
New product related services	50.4%	3
New organizational concepts	37.4%	4

Table 1. Share of manufacturing companies in Vojvodina that cooperate with external organizations in specific innovation areas.

The analysis demonstrates that organizations collaborate with other organizations and external parties mostly in the domain of product innovation (69.1% of respondents). Furthermore, in the case of innovation areas such as technical production process innovation and product related services innovation, the number of companies cooperating is also above 50% (58.5% and 50.4% respectively). The lowest share of manufacturing companies that collaborate with external parties is in the field of organizational concepts innovation (37.4%).

Following, figure 2 contains the percentage of manufacturing companies in Vojvodina collaborating with different external parties regarding each of the specific innovation areas.

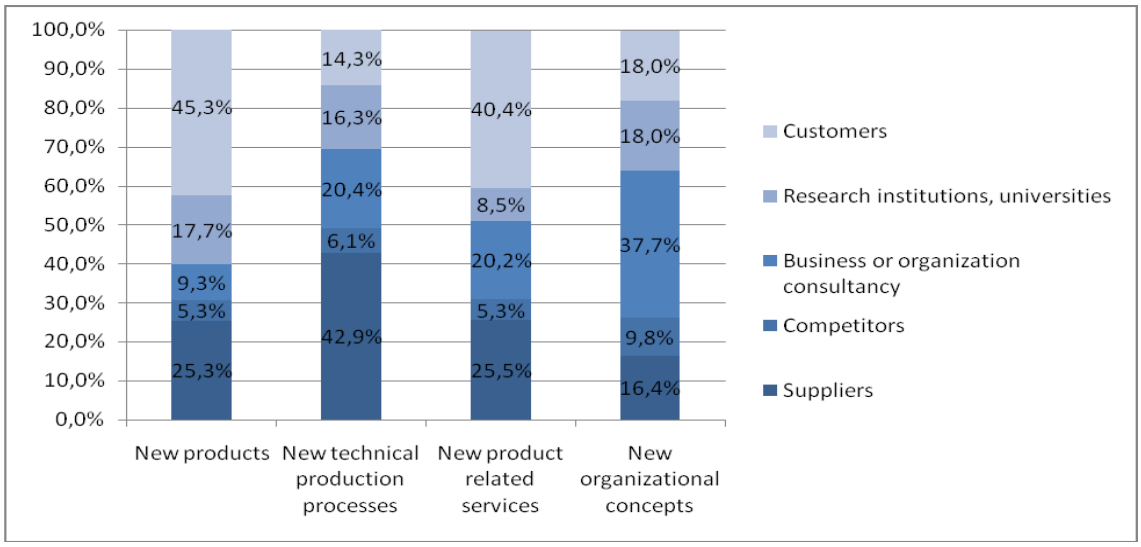

Figure 2.The percentage of manufacturing companies in Vojvodina collaborating with different external parties regarding each of the specific innovation areas.

Regarding new product development, manufacturing firms in Vojvodina mostly cooperate with their customers (45.3%), and with their suppliers in the second place (25.3%). When it comes to innovation in terms of technical production processes, companies cooperate by far most frequently with their suppliers (42.9%). In the area of new product related services the most frequent partner in cooperation activities are customers (40.4%) and following, suppliers (25.5%). Finally, most of the companies have marked business or organization consultancy as their collaboration partner in new organizational concepts development (37.7%).

In each of the specific areas of innovation, the lowest share of manufacturing companies has pointed out competitors as their collaborative partners. This may be explained by the insecurity of firms when it comes to sharing their specific knowledge, expertise or internal processes to the competitors and by the fact that every collaboration process requires intensive management of knowledge and information flows which increases in case of cooperation with competitors.

Figure 3 contains the frequency of collaboration of manufacturing companies in Vojvodina with different external parties regarding each of the specific innovation areas.

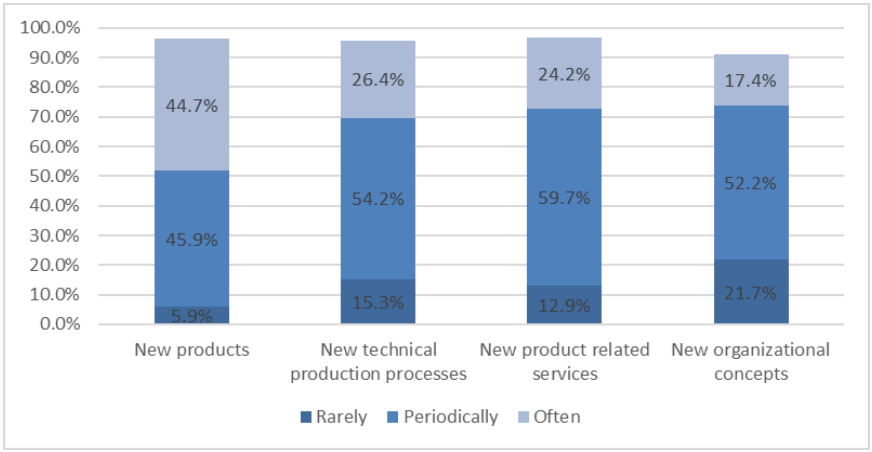

Figure 3. The frequency of collaboration of manufacturing companies in Vojvodina with different external parties regarding each of the specific innovation areas.

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Figure 3 shows that the majority of the respondents reporting that collaboration of their firm with other companies or organizations exists, have also defined the frequency of their collaboration as periodical or frequent. However, it can be observed that the frequency of inter-organizational collaboration is the most intensive in the domain of new product development, mildly decreasing in the area of new technical processes and product related services. Finally, the frequency of collaboration is lowest when it comes to the innovation of organizational concepts.

Based on results presented in Table 1, Figure 1 and Figure 2, it can be discussed that most of the manufacturing firms are cooperating with other firms, suppliers, buyers, competitors and research institutions in the area on new product development (69.1%). Furthermore, the most common partners in collaboration for innovation of products or services are buyers (45.3%). Also, the results show that manufacturing firms are choosing different partners regarding different areas of innovation. Compared to the results from similar studies, there is notable difference. While in Vojvodina most manufacturing firms tend to develop stronger cooperation relationship with suppliers and buyers, in developed European countries most of the manufacturing firms are leaning towards more intensive cooperation with research institutions. Nonetheless, the same study shows that manufacturing firms in developed European countries are more often cooperating in new technical production processes development, new product related services development and new organizational concepts [22].

Importance of different innovation areas for manufacturing companies in Vojvodina

Figure 4 demonstrates the evaluation of importance of different innovation areas for manufacturing companies in Vojvodina. Manufacturing companies participating in EMS were asked to assess and rank 4 domains of innovation activities (improvement of product offer with related services, new organizational concepts, new technological production processes and new product development) in terms of their importance for their companies. Companies were evaluating using a scale 1-4, where 1 is the most important and 4 the least important innovation area for them.

Manufacturing companies have assessed new product development as the most important innovation domain for their firm and business. That is one of the reasons why more attention is dedicated to this innovation area in the next sections.

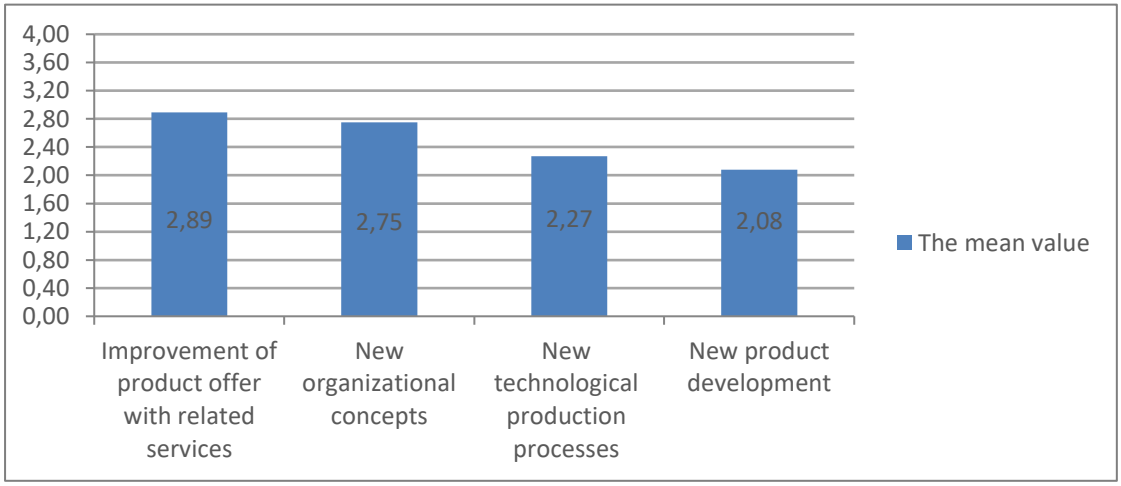

Figure 4. Innovation areas ranked by the importance for manufacturing firms

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Inter-organizational collaboration in product innovation activities

The last research aim is to examine if there was a connection between the existence of inter-firm collaboration and the capability for new product development, as an aspect of innovativeness. In other words, the goal was to analyse if firms cooperating with other organizations in new product development activities have increased innovativeness in terms of new products development. In order to achieve that, the percentage of companies that have introduced innovative products to the firm and to the market in the last 4 years has been compared considering whether those firms are cooperating with other organizations in product innovation activities or not.

New product development requires interdisciplinary approach which can only be achieved by linking firms with other actors [23]. So far, firms where cooperation for innovation is common practice have been introducing innovations new not only to the firm, but also to the market 11] and in the same time with the opportunity to accelerate the process of product development through collaboration [24]. The main assumption is that the firms collaborating with external parties in the field of product innovation and in R&D innovate their products more often than the companies that do not cooperate or do so only rarely, both in the firm and on the market.

The analysis showed that 65% of manufacturing companies in Vojvodina claiming they are collaborating with other organizations in the new product development, have introduced new products since 2012, out of which almost 30% are innovations to the market. On the other hand, 25% of firms claiming they do not cooperate in the area of product innovation have introduced new products to the firm and only 5% new to the market. Considering this, the assumption that firms collaborating with external parties in the field of product innovation innovate their products more often than the companies that do not cooperate or do so rarely, both in the firm and market has been confirmed in the case of manufacturing companies in Vojvodina.

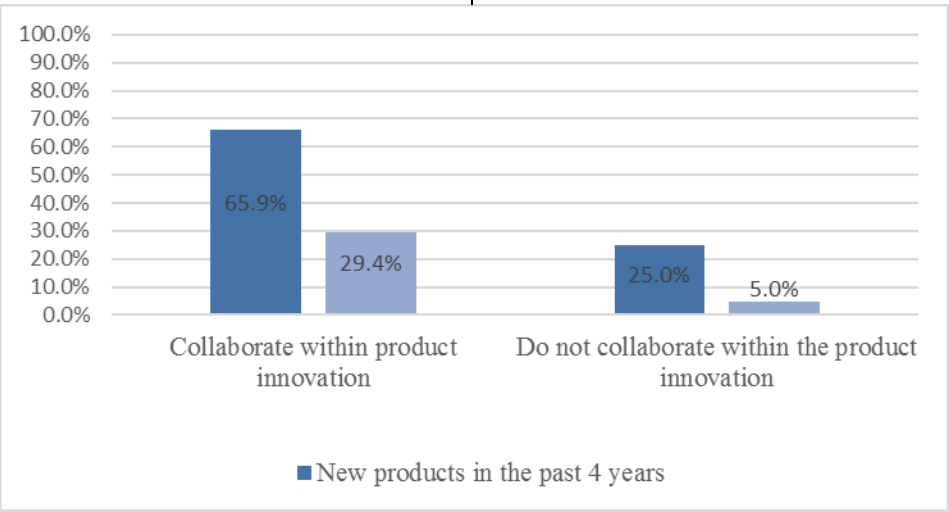

Figure 5. Connection between the existence of inter-organization collaboration and product innovation

Inter-organizational collaboration in R&D and firm innovativeness

Cooperation activities are considered as efficient means for the industrial organization of complex R&D and innovation process [11]. As companies are experiencing pressure in terms of shortened time from an innovative idea to its commercial success, they are realizing that R&D activities could not be performed on their own, but rather through acquiring knowledge and ideas from other

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companies and institutions [7]. Furthermore, it is perceived that cooperation increases the profitability of research and development [25].

One of the incentives for undertaking collaborative research and development with other firms or institutions is the fact that the capacity of a company to absorb and exploit the knowledge from the external environment has a positive effect on the probability of being a successful innovator [21]. As innovation activity is considered directly related to the amount of money companies spend on R&D activities [25] it is expected that firm collaboration and joint investment in R&D will result in higher innovation capacity. Generally, firms engaged in the innovation process are recognizing the necessity of taking part in R&D cooperation in order to obtain expertise which could not be generated in-house. Considering that, R&D collaboration with other companies and institutions is seen as the crucial way to make external resources available and usable, since it enables efficient knowledge transfer, resource exchange and organizational learning [4]. Finally, most commonly innovations are associated with research and development activities of the products [27].

Taking the previously mentioned into consideration, it seemed important to analyse the practice of R&D inter-organizational collaboration in Vojvodina, in order to present the degree of existence and frequency of such practice. Furthermore, the assumption was that the firms claiming they have introduced a new innovative product in the last four years will mostly be those taking part in R&D cooperation. This hypothesis is based on the fact that the absorption of external resources through such cooperation leads to an extension of firms' capabilities of developing new products.

To analyze if firms cooperating with other organizations R&D activities are more innovative in terms of new products development, the percentage of companies that have introduced innovative products to the firm and to the market in the last 4 years has been compared considering whether those firms are cooperating with other organizations in research and development activities or not.

Figure 6 shows comparison between the percentage of manufacturing firms having introduced new products in the firm and to the market in the last four years depending on whether they collaborate in R&D or not.

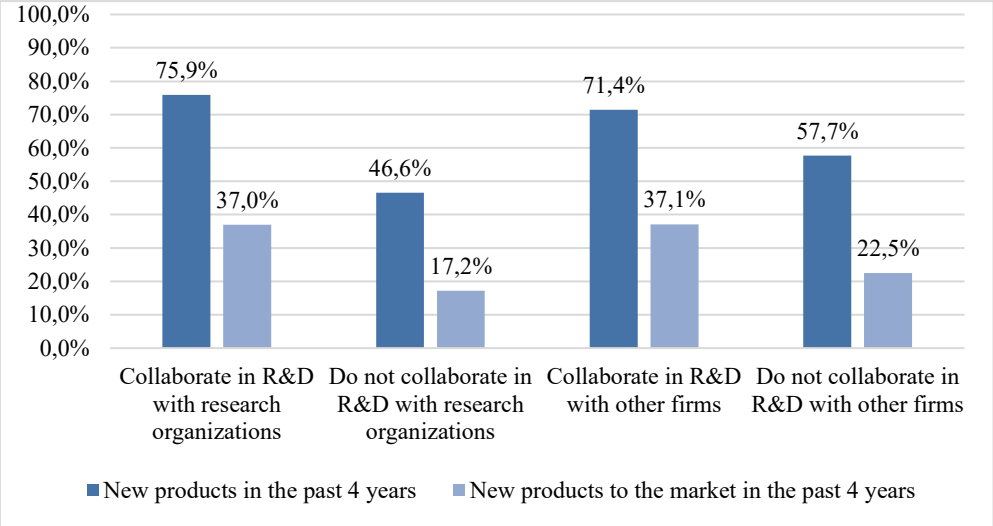

Figure 6. Connection between the existence of inter-organization R&D collaboration and product innovation

Regarding the firms collaborating in R&D, a high level of product innovations was observed. 75.9% of companies cooperating in R&D with research organizations confirmed they had developed new products in the last four years, out of which almost half (37%) were products completely new to the market. A very similar situation applies to the companies that choose to collaborate in R&D with other firms. However, a noticeably lower percentage of manufacturing firms in Vojvodina that do not cooperate in R&D with research organizations or other firms have introduced a new product, both to the firm and to the market, demonstrating that there is considerable difference in innovativeness between manufacturing firms collaborating in R&D and those not collaborating with other firms or research organizations.

Similar study covering European countries are aligned with the results presented in Figure 5 and Figure 6. Companies cooperating with other firms in R&D and product innovation activities demonstrate higher innovativeness in terms of new products commercialization. The European manufacturing companies show the increase of interest in collaboration in R&D and product innovation activities, since it had proved to be an efficient mean for the improvement of innovativeness [5]. Furthermore, the study shows that the percentage of European manufacturing companies engaging in collaboration for innovation increases more rapidly than in the past.

Conclusion

In this paper we have analyzed and presented the state of collaboration between manufacturing companies in Serbia and other firms or organizations in terms of innovation activities. The research questions are to investigate level and frequency of collaboration of manufacturing firms with other different external parties, in different areas of innovation, to investigate the perception of manufacturing firms regarding the importance of different innovation areas, and finally, to examine whether the more intensive inter-organizational cooperation in new product development and R&D activities influences the higher firm innovativeness in terms of innovative products.

To analyze previously mentioned issues, EMS (European Manufacturing Survey) was conducted and results were presented with descriptive statistics.

The results show that there is a high level of cooperation with customers, suppliers, business consultancy and research institutions. Collaboration with competitors in different areas of innovation exists, however, it is on a notably lower level than with the previously mentioned external parties. Out of four defined areas of innovation: new product development, new technological production processes, new organizational concepts and new product related services, inter-organizational cooperation most frequently occurs in product innovation activities. Additionally, product innovations have been emphasized as the most important area for manufacturing firms business.

Furthermore, the analysis demonstrates that manufacturing companies collaborating with other organizations in product development and R&D activities are notable more innovative, in terms of innovative products, than companies that are not collaborating. In case of manufacturing firms declared as participants in product innovation activities, a considerably higher percentage of them had introduced new products to the firm (65,9%) and to the market (29,4%), than firms not engaging in cooperation with other companies or institutions (25% and 5%, respectively). Moreover, when it comes to the companies cooperating in R&D activities, in average 73% of them had introduced

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new products to the firm, and 37% to the market, while in average 50% of companies that are not cooperating in R&D have introduced new product to the firm out of which only around 20% have introduced products new to the market. Considering that, it can be said that there is a strong bond between inter-organizational collaboration and innovativeness in the case of manufacturing firms in Vojvodina. Therefore, firms tending to strengthen their market position and competitiveness through improvement of their innovativeness should cooperate with other firms, suppliers, research organizations, buyers and competitors.

In this paper the location of collaboration partners was not taken in consideration. Related to that, as further research question we see investigation of influence of partners' location on collaboration forms, frequency, success and similar.

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Category: preliminary communication

Mustapic Dragan [1]

The Role of Human Resource in the Success of Small Hotels

Abstract:

This paper is an attempt to explore and prove that human resources in small hotels are a fundamental factor in the success of their business. Ten volatile human resources variables included: satisfaction of job-seekers; career development; motivation; a tendency to continuous learning; commitment to the organization; innovation and creativity; identification with the organization; relationship to work; relationship to quality of service; the likelihood of accepting changes in business. Three research goals have been set: 1. Prove that human resources are the underlying and primary resources and capital that directly affect the operation of small hotels. 2. Prove that human resource performance and resource management is fundamentally different from performance and management in large hotels. 3. Prove that human resources are essential elements in achieving growth, competitive positions, and market share of small hotels. The research was based on a quota, stratified sample. The sample size would be 200 examinees (n = 200). The sample was selected from small hotels in the four counties of Dalmatia. Dubrovnik-Neretva, Split-Dalmatia, Šibenik-Knin and Zadar. Out of these counties, the total quota of fifty (50) small private hotels was selected. It is proven that human resources are the underlying and primary resources that directly affect the business of small hotels. Of all ten determinants of business success, several determinants have been shown to have a high correlation with human resource variables.

Keywords:

small hotels; business success; human resources

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Introduction

This paper is an attempt to explore and prove that human resources in small hotels, such as Dalmatia, are a fundamental factor in the success of their business. Hotel offers and facilities are not the only absolute prerequisite for the hotel's success. Without high-quality people who have the necessary knowledge, skills and skills that are motivated and who work in the hotel to see their goals and achieve synergies with the goals of the hotel, there are no conditions for a successful hotel business and its long-term survival [1]. Science is not unknown and it is not explored that human resources and intellectual capital represent the primary capital of every successful organization [9]. Publicly published papers are mainly focused on major hotels and hotel systems and have almost failed to address the specificity of small business operations through an attempt to bring this success to human resources [2].

Small, private hotels include and processed hotels in the four counties in Dalmatia (Dubrovnik-Neretva, Splitsko-dalmatinska, Šibenik-Knin and Zadarska). The source of these counties is a deliberate choice. In choosing to go from some common features of small hotels in them (subject to seasonal oscillations of summer tourist season, guest structure, character of hotel offer, hotel size, etc.). It is believed that both theoretical elaboration and the results of empirical research will offer new and significant scientific contributions that will enable the management of small hotels to valorize human resources in the most effective way. Then set the elements of effective management of these resources to increase business efficiency, market position and enable long-term sustainable development.

What is a scientific problem is certainly to determine the performance of human resources in small hotels and to point out their position, position, role, and mechanisms that link them to the success of small hotel business? This aspect is not well known in science. Also, how much human resources and systematic management are they doing through the success of small hotels to increase sales of their services, the satisfaction of their guests, thus contributing to revenue growth, market, loyalty of guests, market share? Nor is this aspect scientifically explored enough.

The conceptual framework of human resources in small hotels

Human resources are represented by all employees in organization with all their accumulated and potential knowledge, overall abilities, and experiences, virtues, motives, desires, habits and needs [10]. In all their differences, if known and able to direct people, they represent the strongest power, the greatest resource, the most powerful capital of each organization in its survival and the development of market positions [3]. People are the only resource in an organization that is self-sufficient and self-sufficient to change, adapt to a turbulent environment, initiate change, and offer new solutions [12]. Organizations without people are not an integral entrepreneurial structure. People have always been focused on organizations that represent a specific tool, path, or tool for realizing human personal needs and realizing their life goals. People are a specific component of all organizations [11]. Cascio and Thacker in the functions of human resource management include [5]:

1. Human resources recruitment including: job analysis, human resource planning, recruitment, selection and job placement.
2. Development of human resources that includes professional orientation, training and career management of employees.
3. Rewarding Employee Wages, Motivation and Benefits.
4. Adaptation that deals with labor relations, organizational association, collective bargaining,

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legal regulations, ethics and organizational behavior.

5. Support and Evaluation of Human Resources that Contain Work on Safety, Health, Cost and Valuation of Employee Work

Stone and Meltz, somewhat reduced in relation to Cascia and Thacker, observe the functions of human resources and state the following [17]:

1. Human Resources Planning,

2. Acquiring human resources, including ensuring the acquisition of knowledge, skills and skills required in the work,

3. Development of employees focused on the needs of the organization and the individual's preferences in his or her career,

4. Maintaining resources that include compensation for their work and commitment, retention in the organization.

When considering the content and functions of human resources management in all organizations, even small hotels, it is necessary to distinguish them strategically and operationally [8]. Although these two dimensions are often pervasive and conditional, however, they are two different structural and content and management levels. Human resource management content in small hotels can be classified as:

1. Planning for human needs, obtaining human resources and introducing new people into jobs,

2. Selection of human resources for the purpose of assigning jobs and tasks, and advancement within the hotel organizational structure,

3. Motivating employees to focus their existing knowledge, skills and skills in creating guest satisfaction and realizing business interests and hotel activities,

4. Permanent organizational learning, which implies that all employees in small hotels are constantly, organized and planned, acquire new knowledge, skills and skills, and exchange them with each other and transfer them to others,

5. Evaluating, analyzing, and tracking the performance of each employee in order to achieve a more stimulating and fairer reward for employees.

Difficulties in managing human resources in small hotels

There are a number of difficulties that characterize the management of human resources and are encountered by the owners and management of small hotels. The most common are:

1. Small hotels are more often less attractive for young employees, as most of them are looking for jobs in larger hotels, expecting greater career prospects and gaining more knowledge and experience. Therefore, in small hotels it is more difficult to ensure the interest of young, especially highly qualified staff.

2. The most frequent recruitment of new people in small private hotels, as they were in the sample of this research, is carried out within the circle of family and close relatives. However, such a recruitment model increases loyalty (loyalty, loyalty) to the hotel and the motivation to work. On the other hand, the side carries the risk of not employing talented people beyond that circle.

3. Small hotels in relation to large hotels have a much smaller market, so they have more flexibility in offering their services. Changes in business and market orientation in small hotels are far more frequent and more radical than the big hotels. This requires from all employees the readiness to constantly change, and thus to acquire new knowledge, skills.

4. The smallest hotels are usually few employees. There is no strictly defined job specialization as in large hotels. Almost all employees must be trained to almost work almost all other jobs with quality. This is also the process of permanent learning in the organization and the transfer of the learned specific.

5. The problem of positioning accountability in small hotels is unlike most of the larger hotels. Errors and omissions made are immediately noticed and it is not usually a harder to find out why they came up and who did it. Usually, this fact leads to an even worse side of human resources management. Namely, relying on intuition, personal experience, and constant contact with employees, guests and quality of service, the management of small hotels rarely performs appraisal of employees. Valorization of the work and performance of the employees is done on the basis of a subjective assessment and assessment by the small hotel management or the immediate leader of the working group,

6. Motivation in the observed small hotels is poorly developed. The basic motivator is usually only paid with the addition of higher turnover (in the form of commission or prize). There are no other motivators. This is a bad thing because it would be possible to achieve much better results on business and business performance through benefits or participation in the profit or ownership gained.

7. Human resources in small hotels are mostly taken care of by the hotel management (hotel manager). Support from specialized foreign human resources agencies is hardly required anywhere. The management of the observed small hotels is not generally well-equipped for a more efficient way of managing human resources because they did not include in different human resource education and training programs.

Human resources and the success of small hotel business

Conceptually, business performance is probably one of the areas of business economics in which there is still no higher consensus on the meaning and content of this notion. It is even less when it comes to performance indicators. A large number of authors in terms of business performance consider the basic financial performance of the total revenue, total expenditures and gross profit [6]. Karić considers efficiency, efficiency of business and profitability under performance indicators [13]. Stipic [16] also has a similar approach to conceptual definition and focus on business success. Drucker defines the efficiency of a business through efficiency, ie how to do things correctly, and through effectiveness, or how to do the right thing [7]. Buble et al. Under the term business success, however, they emphasize a number of financial indicators [4]: liquidity, indebtedness, activity, profitability, investment. Osmanagic-Bedenik, citing Weber, points out that internal and external performance factors need to be distinguished when considering the concept of business success and performance metrics [15]. The internal factors of the company's business performance are: accumulated asset growth, growth of own capital, profitability of total capital, turnover profitability, book value and market value ratio, capital financing, employment etc. External factors of business performance are: enterprise introverts, customer relationship, relationship according to human resources and others. Small Business Hotel Performance Indicators should always be observed from the aspect of human resources. It is immaterial that human resources do not give priority to the physical resources and physical capital of the enterprise and that they are not considered as the most important resources of each organization, and there is a high level of consensus among the authors [14]. On the other hand, almost no one is included in the essential factors defining the business performance of a company. Therefore, small business hotel performance indicators can be classified into three major groups: market, human and financial indicators. That way, almost one hundred performance indicators can be achieved.

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Variables of research

The following variables have been set in this research:

Dependent variables (y) - Successful operation of small private hotels in Dalmatia.

Independent variables that represent the selected performance of small hotels (ten independent variables) are:

1. Job satisfaction,
2. The satisfaction of respondents with career development,
3. Motivation of respondents,
4. The tendency of respondents to continuous learning in the organization,
5. Attitude (loyalty) of respondents to a hotel,
6. Innovative and creative orientation of respondents,
7. Level of identification of respondents with a hotel,
8. Relationship of respondents to hotel guests,
9. Respondent's relationship with hotel quality,
10. Attitude of respondents to hotel changes.

Research goals

The research aims to achieve the following three goals:

1. Prove that human resources are the underlying and primary resources and capital that directly affect the business of small hotels.
2. Prove that human resource performance and resource management is fundamentally different from performance and management in large hotels.
3. Prove that human resources are essential elements in achieving growth, competitive positions, and market share of small hotels.

Hypotheses

The following three hypotheses are put forward:

Human resources, focused on selected performance, are key determinants of small business performance. H1

The effectiveness of human resource management is a significant factor in the success of small hotel business. H2

The performance of human resources in small hotels is fundamentally different from the performance of large hotels. H3

Methodology

The research was based on a quota-stratified selected sample. The sample size would be 200 examinees (n = 200). The sample was selected from small hotels in the four counties of Dalmatia. Dubrovnik-Neretva, Split-Dalmatia, Šibenik-Knin and Zadar. Out of these counties, the total quota of fifty (50) small private hotels was selected. Four respondents surveyed each hotel. In defining the sample under the term "small hotels" are considered:

1. Hotels with at least 4 permanent employees, and not more than 15 (not including directors, hotel management)
2. Employees who are employed in the summer season alone and who have a status for at least the last three years are considered to be full-time employees and permanent seasons.
3. Hotels that have been in business for at least the last three years.

Employee records were used for the purpose of testing the performance of human resources from all permanent employees in small hotels. The choice was made so that four hotels were surveyed from each hotel. Depending on the number of permanent employees (the size of the hotel), the selection of respondents (every second, third, fourth, etc.) was determined. Employees, job descriptions and qualifications are not taken into account in order to achieve the more objective structure of the employees in the sample. For the purpose of determining the performance of a small hotel business in a survey interview, the hotel directors or the persons authorized by them (Assistant Director,

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Finance Manager and Accounting etc.) participated. Most often they were hotel directors who are also their owners. The research used: external (outside) data outside small hotels, internal data from various statistical and accounting records of small hotels, data obtained by polling.

Data acquisition by field test method was performed using two questionnaires. One questionnaire was for the collection of observed variables of human resources and the other for the collection of business indicators. Survey questionnaires are specially designed for this research. They contain questions that were directly addressed to the respondents. Questionnaires are structured content. The survey was conducted during the summer months, the main tourist season in 2016. Surveys were conducted by interviewers who were instructed through a one-day instructional seminar on which detailed questionnaire surveys were provided with the survey timing and other organizational and control aspects.

Quantification of all independent variables was performed through three levels: low, middle and higher. Thus, for example, the satisfaction of the respondent's satisfaction with the job is a low level of satisfaction is indicated by the statement "I'm happy with the job I'm doing and I'm trying to do it right". The middle degree of satisfaction "I like to do this job for which I've been educating and enjoying this job". Higher degree of satisfaction: "I see my chances of giving this job a lot, because I will make more money".

The performance of the observed small hotels was observed through the following ten parameters (averages calculated on the basis of the last three business years): total revenue growth; gross profit; new guest growth rate - organized visits; rate of drop in number of guests; the declining rate of complaints by guests; the rate of introduction of new business changes; growth rate of investment in physical capital; growth rate of investment in human capital; rate of fluctuation of employees; the rate of fall of absenteeism.

Quantitative processing, interpretation and analysis of the obtained results used the indicators of observed statistical features: arithmetic mean and dispersion measures. Pearson correlation coefficient was used to calculate the strength of interrelation between variables.

Research results

Employee Satisfaction and Business Performance

It was found that high-level employees at work demonstrate that there is a strong link between this and more determinants of the performance of small hotels. This interconnectivity is expressed by the average annual growth rate of new guests (coefficient 0.71), the average annual decline in the drop in the number of existing guests where the correlation coefficient of 0.83 was established. With the average annual rate of fall of employees' absenteeism (coefficient 0,76), and with the strong correlation of variables, the average annual growth rate of changes in the organization and operation of hotels (coefficient 0,64). The average strength of interconnections with the variables of the performance of small hotels was determined for employees with the middle degree of satisfaction shown: average annual rate of decline of complaints, appeals and complaints of guests (coefficient 0,63) and average annual rate of employee turnover (coefficient 0, 57). Employees who showed discontent with the job did not notice any significant correlation between the variables of this dissatisfaction with the variables that were tracked as indicators of the performance of small hotels.

Employee satisfaction with career development and business success

Employees who have expressed their full satisfaction with career development are strong

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interconnections: average annual growth rates of new guests and career development (coefficient 0.75); the average annual growth rate of changes in the organization and operation of hotels with career development (coefficient of correlation 0.78) and the average annual drop in employee absences (coefficient 0.74). The average strength of the interconnectedness of the dependent determinants of business success and variables of career development of employees was observed in: average annual decline rates of existing guests and career development satisfaction (coefficient 0.61) and average annual employee turnover fluctuations and career development (coefficient 0.66) . For mid-level positions in career development, three dependency determinants of business performance with independent satisfaction variables were noted for the medium-intensity career development: the average annual growth rate of new guests and career satisfaction show a correlation of 0.53; the average annual rate of decline in the number of complaints, appeals and complaints of guests and satisfaction with career development coefficient 0.55 and the average annual growth rate of investment in human capital and the degree of career development coefficient 0.58. Employees who expressed their dissatisfaction with career development are not significantly correlated with the variables of that satisfaction and determinants used for the success of small hotel business.

Employee motivation and business success

The intensity of the interrelationship between motivational variables and the determinants of the performance of small hotels was noted in the segment of employees who presented a high degree of motivation at the average annual decline in hotel guests (coefficient of correlation 0.77) and the average annual decrease in the number of complaints, complaints and guest complaints (coefficient of correlation 0.65). The average high correlation between the determinants of business performance and the average annual decrease in the number of complaints, appeals and complaints of guests (coefficient of correlation 0.52) was reported among the respondents classified as medium motivated.

The likelihood of employees getting into continuous learning in organization and business success

Calculated Pearson correlation coefficients indicate the existence of very strong interconnection between only a few variables characterizing the tendency of employees to learn and determining the performance of small hotels, in those who showed high readiness to learn. These are: the average annual decline in the drop in the number of existing guests, the correlation coefficient of 0.84; the average annual rate of decline in the number of complaints, appeals and complaints by the guests (correlation coefficient 0.79 and average annual growth rate of changes in organization and operation of the hotel (correlation coefficient 0.63) In the segment of employees who expressed the average intensity of readiness for continuous learning in small hotels it is only one variability of learning preference in a strong correlation with the determinants of business performance, and the average annual rate of decline in the number of complaints, appeals and complaints of guests with a coefficient of 0.57.

Attractiveness (loyalty) of hotel employees and business success

The established Pearson correlation coefficients show that there is a very strong interdependence of independent variables that represented the loyalties of employees and the chosen determinants of business success. This strong interconnectivity of these variables is characteristic only of highly-valued employees: average annual growth rate of

gross earnings (coefficient 0.78), average annual growth rate of new guests 0.62, average annual decrease of existing guest drop-coefficient 0 , 65 and the average annual growth rate of changes in the organization and operation of hotels (coefficient 0.84). Strong correlation between the variables observed was found among respondents who showed a medium intensity of loyalty to the organization: the average annual growth rate of new guests (organized visits) - the coefficient 0.50 and the average annual decline in complaints, appeals and complaints (coefficient 0.53).

Innovative and creative orientation of employees and business success

Structural indicators of innovative and creative orientation of employees are followed by Pearson's coefficients of correlation between independent variables that represented this innovative and creative orientation of employees and selected determinants of the success of small hotel business. Only the respondents who showed great innovative and creative orientation established the existence of very strong interconnection with the average annual rate of decline in the number of complaints, appeals and complaints of guests (coefficient 0.73), and strong correlation with the average annual growth rate of new guests (coefficient 0 , 51).

The level of employee identification with the hotel and the success of the business

The established Pearson correlation coefficients indicate that there is a very strong correlation between independent variables that define the degree of employee identification with the selected determinants of the performance of small hotels in highly-researched individuals. This is shown by the following variables: average annual decline rate of existing guests (organized visits) - coefficient 0.83, average annual growth rate of change in organization and hotel operations (coefficient 0.87), average annual growth rate of investment in physical capital coefficient 0.71), the average annual employment rate (coefficient 0.68) and the average annual rate of fall of employees' absenteeism (coefficient 0.77). In the case of medium intensity and content identification with the organization, the existence of the interconnection of two independent variables with the determinants of the performance of medium intensity of intensity and interconnection was determined: average annual rate of decline of complaints, appeals and complaints of guests (coefficient 0,65) and average annual rate of fluctuation of employees (coefficient 0.51).

The ratio of employees to hotel guests and the success of their business

The ratio of employees to hotel guests represented through ten independent variables shows in four variables the existence of significant interconnections with the selected determinants of the performance of small hotels. Very strong correlation was established among respondents classified in the segment of highly-constructed customer relations with two variables: the average annual decline rate of existing guests, the correlation coefficient 0.66, and the average annual decline in the number of complaints, appeals and guest complaints (coefficient 0.88 The existence of a very strong connection has also been established in respondents who have a medium-built relationship with guests at the interrelationship of the variable, the average annual rate of decline in the number of complaints, appeals and complaints of guests with the determinants of business performance with the coefficient of correlation 0.63. respondents who have a highly-constructed relationship with hotel guests with variable interdependencies average annual growth rate of new guests (organized visits)

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in the determinants of business performance (coefficient of correlation 0.59).

Relationship of employees to the quality of hotel services and business success

In three of the ten variables that represent the relationship between employees and their participation in the quality management of small hotel services, it has been established that there is a very strong interconnection of the same with the chosen determinants of business success. In respondents participating in high participation in quality management of these services are: average annual growth rate of new guests - correlation coefficient 0.67; the average annual drop in the drop in the number of existing guests - the 0.88 coefficient and the average annual decline in the number of complaints, appeals and guest complaints (coefficient 0.79). Very strong interconnectedness was also registered with respondents who were nominated to participate in middle and quality management at the average annual drop-out rate of existing guests - the correlation coefficient of 0.75. There is strong interconnectedness among respondents with high participation in quality service management between the variables of the average annual growth rate of changes in the organization and operation of the hotel and the determinants selected to monitor the performance of small hotels (coefficient of correlation 0.56).

The tendency of employees to change hotel and business success

In the respondents who expressed strong readiness to participate in hotel changes, there was a strong intensity of interconnection with the average annual rate of decline in the number of complaints, appeals and complaints by the guests (correlation coefficient 0.74), and strong correlation with the average annual rate of growth of new guests visits) - coefficient 0,61.

Conclusion

The first goal of the work was completed and human resources proved to be the fundamental and primary resources that directly affect the operation of small hotels. Of all ten determinants of business success, several determinants have been shown to have a high correlation with human resource variables. These are: the average annual growth rate of new guests; the average annual decline rate of shrinking existing guests; the average annual rate of decline in the number of complaints, appeals and complaints of guests; average annual rate of employee turnover; the average annual rate of fall of the employees' absenteeism. The direct impact and the existence of high correlation of human resources with the determinants of business performance were not confirmed: the average annual growth rate of total revenue; average annual growth rate of gross profit; average annual growth rate of investment in physical capital; the average annual growth rate of investment in human capital.

The second set goal was to determine that human resource performance and resource management differed significantly from management performance at large hotels, which was confirmed by several important research findings. The tendency of employees to learn and acquire new knowledge and skills in the organization is not satisfactory, since more than half of the respondents are not considered to be constantly learning and that there is no greater benefit to them. Negative attitudes and attitudes towards continuing education of employees are likely to be due to lack of motivation for learning, lack of strategic vision and strategic leadership of small hotels, etc. There is a strong commitment of employees to the organization. A kind of fear of losing this job, possible long-term unemployment and fear for their

own existence and family existence are most likely to be a major factor in their loyalty to the organization. Employees in small hotels are confirmed with a high degree of loyalty to the organization and because they were mostly "family hotels" where this loyalty is surely greater than the loyalty of employees to large hotels.

The third set goal is also met. Employees who have achieved full satisfaction with their career development and location in the organizational structure of the hotel are significantly more active in retaining existing guests, hence the dangers that can be interpreted as a reflection of their efforts to maintain and improve the quality of hotel services, which then directly reflects on the success business. Another, element of the growth of market positions of small hotels through human resources is the motivation of employees. The growth of market positions and the competitiveness of small hotels can also be reflected by the fact that there is no significant impact on the innovative and creative orientation of employees in small hotels on the observed sample. Respondents identified their relationship with hotel guests as highly constructed and built in 86.9% of the total number of respondents. This is certainly a quality structure for employees, as it provides the basis for building a small hotel quality management system and management system for profitable guests. Not a satisfactory structure of market growth and market position of small hotels where more than half of the respondents (employees) in the examined sample are unwilling to accept or participate in constant changes of the hotel. This fact is from the point of view of the need to constantly adapt the business of small hotels to the needs and requirements of their environment very bad.

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PHOTO 2.
Prolaz | Passage
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Category: preliminary communication

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Development of ERP and Other Large Business Systems in the Context of New Trends and Technologies

Abstract:

This paper presents an overview of terms, concepts, trends and technologies that are relevant to today's business. It describes the basics of data and information integration and flow in a company through a central ERP system with concepts of CRM and SCM. The emergence of big data as a tributary of a huge number of often unstructured data from different sources can become a central problem or opportunity for advancement and achievement of competitive advantages of a company. Ignorance of key figures and/or the non-acceptance of new business conditions, new technologies and possible deployment solutions are the main reasons for non-productivity and poor business performance. To demonstrate the dynamics of appearance and popularity of terms, concepts, trends and technologies this paper offers a tabular overview of the frequencies based on the data from 3 global databases. Meta analysis shows the expected future development of analytical trends and technologies. This paper is intended for those who lead, run and participate in projects of implementation of large software systems, dealing with quality management of business, or want to understand the complexity of this area and the future directions of development.

Keywords:

ERP; BI; DSS; SCM; CRM; big data

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Introduction

Getting specific information for specific job-situation-task, means that data from different sources must continuously be collected, stored and analyzed. Care and use of so much data is impossible without a well-structured database and/or data warehouse, and the analysis of this data is impossible without a series of BI (Business Intelligence) tools. Information therefore needs to be within easy reach and analyzed in order to give effect to the business objectives [1], and information systems should be changed, integrated and introduced precisely in order to realize this goal. [2]

Companies whose executives understand data as a core asset and resources of business are six times more likely to be successful than those whose top management does not perceive data in this way (31% vs. 5%) and have a lot more success with BI projects. [3].

Technological progress and the information needs of companies today create a continuous cycle of growing needs for ever more effective ways of coverage and analysis of data in and around the company. Currently, the society is faced with a growing, large and various sources of data, which is often referred to as big data, and is used for decision support. Big data are complex, layered, large amounts of data and finding i.e. getting the right information in such a large amount of data is like searching for a needle in a haystack, and the greater the amount of data it is more difficult to find the true value of the data. [4].

Many observers, including [5], [6], [7] and [8] argue that the potential of using big data to improve the personal life or to help companies to compete is unlimited. According to [6], "better access to information and technology for the management and analysis of data is changing the world." In a way, big data will lead to better health, better teachers, improved education, and better decision-making. Gartner hype curve predicts that the big data for two to five years [9] will do much to transform and influence the business.

The goal is not the production and use of vast amounts of data, but the way the data is being analyzed and presented, which techniques are being used to get valuable information and the right support and a base for decision making, and in reality it is about big analytics not just about big data [10] [11]. [12] argues that the management and analysis of these data is precisely the most difficult part in the field of big data. Availability and timeliness of the results of quality analysis in the moments when you have to make decisions is a major challenge. Such phenomena of large amounts of data, and the need for high-quality analysis also require new expertise and experts in many organizations [13].

After describing the perceived problems caused by the appearance of massive amounts of data from various sources, we can see the importance of choosing and using various software tools, technologies and techniques and the efficient management of all data concerning the business seems like a prerequisite for the survival of the various activities of the company.

In consideration of the successful management of a company interaction of large-scale integrated enterprise systems such as ERP, CRM, and SCM with the DSS and BIS is also important, where analytics of business intelligence based on integrated data of the entire company can directly affect a more quality, timely and flexible decision support, and decisions will again directly affect the effectiveness of CRM and SCM. [14].

Setting an ERP for the origin of this systematic review is also reflected in the main target for the implementation of an ERP - access to data in a controlled manner at the level of the entire company

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and information sharing across business processes [15]. [16] suggest that a suitable choice of an ERP system provides results such as increased productivity, punctual delivery, decreased implementation time, and reduced price of a product while a bad choice of an ERP system leads to project failure or performance degradation of a company.

Furthermore, a review links together concepts of BI, DSS - Decision Support Systems, SCM - Supply Chain Management, CRM - Customer Relationship Management, BPM - Business Performance Management with the involvement of the big data sphere. Also shown is the dynamic of representation of concepts from the paper through publications of 3 global scientific-technical databases from 1991-2016 in phases of 5 years. To view the future development of new trends and technologies related to retrieving, storing and analyzing information, generated was a graphical representation obtained by meta analysis of research [17].

Objective of the paper is to review and synthesize the inter-related areas that need to be considered in today's business.
Purpose of the work is to indicate the complexity of the successful implementation of maintenance and future development of ERP and other business systems through a systematic review of interrelationships of large systems, new technologies and trends.

Overview of connection between the ERP and business-critical systems

This section will connect the following terms and concepts: ERP (Enterprise Resource Planning), DSS (Decision support system), BI (Business Intelligence), CRM (Customer Relationship Managemenet), SCM-(Supply Chain Managemenet), BPM (Business performance Management), DW (Data Warehouse, Data Warehousing), KM (Knowledge management) and MEC (Multi Enterprise Collaboration). The objectives of this chapter are:

- To stress the importance, function, purpose and potential benefits of ERP systems,
- To point out the known problems and bad practices observed in the planning and/or after the implementation of ERP in the company,
- To include the actuality of today's business conditions, which requires inter-organizational collaboration - MEC (Multi-Enterprise Collaboration) in decision-making and technological implications and possible solutions to such business.
- To show links of the ERP systems with other large systems, the importance of connection between these systems and the consequent implications of these connections on the criteria in the selection of software modules and ways of implementation
- List some guidance on the selection of software packages related to big business systems and the type of BI analytics

ERP

ERP software automates and integrates business processes and enables the sharing of information and data in a variety of business functions. ERP software enhances the functionality and efficiency of business processes that take place in the departments of finance, human resources, operations and logistics, and sales and markets [18]. Since it affects the entire business, or at least a large part of the business, and its purchase and introduction is a large organizational cost, selection of an ERP system is a particularly complex and delicate task. It is estimated that 40-70% of ERP implementations have experienced some type of failure [19]. Determination of the potential benefits of ERP implementation is a challenging task, because most of the advantages do not come from

the ERP system, but from different ways in which the system can be implemented and used. Although this is true for any type of information system (IS), it is a special burning question for the ERP systems, because of their decisive influence on almost all aspects of the organization. This is even more important in the context of ERP implementation through multi-organization, a subject of work by Eckartz et al. [20].

Companies that decide to introduce the ERP systems are often inspired by imitation of successful practices in similar companies. Such a conviction management board can lead to so-called homogenization of companies which weakens the differentiation, i.e. the uniqueness or specificity by which a company and its products are recognized and stand out in the market. The loss of differentiation and uniqueness can weaken the company's potential and performance that delivers business value. [21] emphasizes the importance of detailed and elaborate evaluation protocols and practices to choose the solution that best suits the company instead of imitating the competitors. This argues the need to inform about all the influential factors of the optimal selection of ERP solutions and overall quality management of performance and operations of the company.

Complexity of approach in the selection of an ERP and the number of factors that affect the success of the implementation was discussed gradually in the further part of the review where the function, purpose, benefits and success of ERP are viewed in relation to the relevant terms of the wider area of managing the performance of a company.

ERP and decision making support

Davenport [22] suggests that the main reason and the greatest potential of ERP is making quality and timely decisions, and Palaniswamy and Frank [23] concluded that the ERP is a prerequisite for decision making support. Part of the research on the effects of ERP to support the decision making proved that ERP systems offer significant benefits in the area of decision making support [24].

Although ERP systems integrate knowledge and provide reporting tools for users to analyze data, decision making support is not their primary purpose. This is supported by a multitude of BI software solutions which the company uses to implement a decision support system, which can not be fully developed only with an ERP solution. Therefore, it can be said that the quality of implementation of ERP systems is closely linked to the quality of the decision making system [25].

ERP and Business Intelligence

Business intelligence is a huge opportunity for any company to collect valuable insights from all the data covered by their ERP and those of other systems. Li [26], referring to the need for the ERP systems to link internal and external data, identifies the need to create an effective business intelligence as the primary objective of an ERP system.

BI software enables companies' quality and quick decision-making because of the availability of data and information in an easily customizable form. The standard functionality of the BI software allows DSS to use the data from the data warehouse, shaped to measure. This warehouse provides management with BI analytical tools, the ability to create ad hoc reports, graphics, tables, use graphical dashboards that offer information through financial statements, scorecards and KPIs (key performance indicators).

BI software is also available as a stand-alone package and as modules in ERP solutions. In recent years, ERP vendors have included BI products and sell them in their systems and have thus made way for potentially highly effective solutions that put on the business-user the new burdens of selection, costs of consultants, education etc. In addition to the BI

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module, many ERP vendors include the very ERP functionality of managing client interactions and promotional campaigns, but such applications are sold as separate software, such as SAP CRM and Oracle's Siebel CRM applications that have additional management capabilities with client activities.

ERP and multi-organizational collaboration

Tools for decision making support and application should be open and flexible enough, not only to provide support within their own organization, but also across organizational boundaries. It stresses the need for research of multi-organizational decision-making and the development of IT which will support and optimize the production [27] and in other areas of business. These includes heterogeneity in terms of the breadth and depth of data, complexity in terms of models, algorithms for solution and data visualization / process, distribution to the scope and range, versatility of domains and paradigms, flexibility, ability to reuse and extensibility [28].

More recently, vendors, including Microsoft, SAP and Oracle have introduced tools and systems that support decision-making aspect of the MEC (MEC, multi-enterprise collaborative). The shift of the market and scientific research towards this field of research is still in its early stages and new perspectives and insights are constantly being acquired as new products are being released.

ERP, data warehouse and knowledge management

[29] point out that the knowledge of the employee is the most important resource of the company, and point out that although the repositories of knowledge in companies often exist, they are not organized in a way that they could be effectively used. The authors [30] observed the importance of integrating the processes of knowledge management (KM) within the Decision Support System so that the decision-makers can combine different types of knowledge (explicit and implicit) and data (internal and external) available in various forms. Improved creation and sharing of knowledge should increase the flexibility and innovation [31]. Literature dealing with ERP success suggests careful knowledge management in order to maximize its potential. Results of the Ifinedo research (Ifinedo, 2006) [32] have shown that knowledge management, including the creation of knowledge, is a strong predictor of ERP success. The more implicit and explicit knowledge the organization has, the more likely that the ERP will be successful [33].

Knowledge exists in the heads of corporate staff and management. Knowledge also exists in the environment outside of the company. The needs of business are also to formalize, store, access and use the entire knowledge of the company.

Data warehousing is not just a problem-solving process, but also a concrete architecture. Different companies have different data warehouses. According to the features of their ERP systems, many companies have designed the architecture of their data warehouses. Data warehouse is responsible for providing the information needed to support decision-making at different levels [34].

Existing data warehouse of a company can be extended to create a knowledge warehouse (KW) [35]. KW will not only facilitate the retrieval and creation of knowledge, but will also improve the retrieval and exchange of knowledge through the organization, providing at the decision-maker's disposal an intelligent platform for analysis. Knowledge warehouses will be continuously upgraded, with the aim of structuring knowledge from previous situations of decision-making and optimize future decisions. Shafiei et al., also mention the concept of a knowledge warehouse (KW)

which is "above" the analysis of data from the ERP system via a data warehouse. [28]. [36] is also in the same vein, that with the advancement of technology expects that the existing business system will provide current intelligence information and not just the numbers, which can be used for making business decisions and strategies. This trend and the need are applicable today through various methods of artificial intelligence, especially in areas of text processing and natural language.

ERP and CRM

With the goal of providing "a single face to the customer," the basic principle behind CRM is that every employee in contact with the client must have access to information on the latest customer interactions with the company [37]. While CRM tools within an ERP, such as the SAP ERP system, when used properly, can help in the management of customer relationships, companies that opt for the concept of CRM often use a separate CRM system that communicates with the ERP system. The advantage of this approach is that the planning and analysis conducted in the CRM system does not interfere with the performance of the ERP system, which primarily handles large volumes of business transactions.

When compared with ERP, for CRM can be said that it, just like the ERP, offers ways to automate the process and conduct business more efficiently. However, these two systems are designed to streamline the various functions. While CRM is used to manage contacts, accounts, opportunities, activities, marketing, etc., ERP is designed to manage the operations and business functions, such as product planning, purchasing, inventory, customer service, order tracking and other back-end business processes. However, after the ERP vendors included the CRM features in their software, and CRM vendors included ERP capabilities into their tenders, the differences between them began to disappear.

ERP and SCM

The study [38] has empirically proven theoretical assumptions in the existing literature on the impact of ERP benefits on SCM competencies. A typical configuration of business software in the manufacturing enterprise includes at least three large systems ERP, SCM and CRM. All are constructed of one or more database management systems (DBMS) - which usually use the same logical integrated database. ERP, SCM and CRM systems are usually standard software that can adapt to the requirements of individual organizations. Today, these three types of systems tend to be integrated: SCM module, for example, will have access to information available in the ERP system directly or through a common database [39].

Supply Chain Management (SCM) is directed across boundaries, taking into account that companies are increasingly concentrating on their core competencies, leaving the other activities to the partners who have more knowledge. With the growing dependence on partners, effective supply chain has become equally important to the success of the company as the efficiency of internal business processes. Information systems that support supply chain management (SCM systems) are developed either by ERP vendors or software companies specializing in logistics. They have either expanded their ERP systems with additional SCM functions or developed new SCM systems that collaborate with their ERP systems.

Software companies are developing dedicated SCM systems and providing interfaces to standard ERP systems. The reason for this is that the SCM without ERP is hardly possible. An interesting trend is that some specialized SCM vendors were bought by large ERP vendors. In this way, ERP vendors are now able to offer supply chain management as part of their business portfolio. A typical company today uses a large number of information systems. These

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systems tend to be integrated, so that they can work together [39].

ERP and BPM

Over time, it turned out that, despite the fact that ERP systems hold most of the organization's data, they can provide insight into valuable information necessary for strategic decision making. ERP vendors are aware of this and offer BI functionality with their software to help "liberate" the data from these complex systems. At its core, BI is designed to consolidate data that extends across different business areas and systems, and help managers to make better decisions faster. In the new paradigm, the ERP system acts as an important source of data, but not necessarily the only source. This opens the door to choice to combine ERP with BI and/or Performance Management Suites and tools that meet the needs of the organization. This may or may not be from the same vendor.

In order to differentiate concise terms BI and BPM it is stated that BI discloses a technology used to access, analyze and inform about relevant business information. It covers a wide range of software solutions, including ad hoc queries, OLAP, dashboards, scorecards, today usually as modules for various BI suite. BPM is characterized as BI + strategic planning, which means that the convergence of BPM and BI planning is on a unified platform, cycle of plan-monitoring-analysis. Processes that include BPM are not new: they exist in every medium to a larger organization, and BPM provides a framework for the integration of processes, methodologies and metrics of other systems into a single solution. Term BPM refers to the processes, methodologies, metrics and technologies used by the company to scale, monitor and manage business performance. BPM is a continuous set of processes which, if properly carried out affects the entire organization from top to bottom. For BPM it is important to synchronize the entire company: it helps users to achieve goals that help the execution of the strategy and the adoption of value for all the stakeholders [40].

Emergence of new technologies and trends - big data and embedded analytics

The reasons for considering the development and potentials of ERP systems and the entire BPM system and big data are reflected in the new capabilities-functionalities of a broader business software system and exploiting new trends and technologies, as outlined below. A large amount of big data is unstructured, such as audio, video, text, and developed techniques of storage, processing and analysis of data types have evolved, there is a possibility that ERP is stored in and managed by a new system, the "knowledge hub" where the knowledge from inside and surrounding environment of the company will be stored and formalized integrally [41].

Taking into account the big data sphere allows analysis of data and transactions that are created outside the company. In this way, all stakeholders, customers, partners, suppliers are connected and the development of applications which will integrate data, models from different business perspectives is expected. Therefore, big data provides the ERP system with additional features and characteristics in relation to other systems, such as CRM and SCM, and thus adds value to the business.

Using data from big data sphere will also initiate some issues of privacy and data security and protection, and the movement of data will need to be constantly monitored and take into account the latest regulations. Also, the quality of the data in the ERP system can be disrupted after the integration of big data, so it is necessary to set some filters when downloading raw data.

These considerations relating to the question of the position of the ERP system and the expansion of the boundaries of the data relevant for the company, with the development of new technologies certainly point to new opportunities for additional functionality of ERP systems and consequently the entire BPM, whose potential can be achieved if new issues which may occur by using big data types are also considered. Problems and changes are mostly related to the processing, storage, analysis and quality of big data. Also, the integration of ERP systems and big data will require some changes in the activities of the stages in the life cycle of ERP systems as a change of requirements to be met by the ERP [41].

As the pace of business accelerates steadily, the company realizes that it is not enough just to analyze the data but the activities that are being imposed on the basis of the results of the data analysis must also be operationalized as soon as possible. This means that the aim is to exploit and share not only data, but also the results of the analysis, and exchange them through the business processes and applications, in order to shorten the time of decision making.

Operationalizing and embedding analytics consists of gaining insight on the necessary actions within the business processes that can be automated or provide support for decision-making. Analytics of different functionality and complexity are usually built into the dashboards, applications, devices, systems, databases and the like. Operational analytics are in the background of logistics applications, some CRM modules, authorizations and detection of faults, the system recommended content and products for each customer and the like. Embedded analytics, while not entirely a new technology today is especially being taken into account due to the occurrence of big data, and the possibility of operationalization of decisions through programs is very effectively. Also, sharing analytics through a variety of applications allows them to be received and potentially exploited by a large number of stakeholders, which is certainly an added value [17].

Research Methodology

In order to show the development of individual concepts through four five-year periods chosen were two science databases (Web of Science, Core Collection, Science Direct), and the database Google Scholar, which shows a large number of scientific and professional publications regardless of the quality to compare dynamics of incidence and popularity. The last columns for each database show the Tendency, which results in a number 1 and the up arrow if constant growth was recorded, and otherwise 0 and arrow down. Attached you can find Table 3 obtained by meta analysis of research (for research details see under [17] which shows the current representation of the use of data types, analytical platforms and types of analytics and prediction for the next three years based on the responses of 300 respondents). The table was sorted by three categories from top to bottom by the intensity of shades: the first category represents concepts that are anticipated to decline in use over the next three years, and the remaining two categories indicate concepts that will be moderately more and much more used in the next designated period.

Research results and discussion

Table 1 is the representation of individual frequencies. In the first two databases the decline is shown only by the concept of Business Process Reengineering, while in the Google Scholar database

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more than one category shows a decline in participation in publications. Each topic was searched with quotation marks.

Table 2 shows the representation of publications that at the same time mention all the concepts related to the operator and a base WoS Core Collection is this time omitted due to the low number of publications for the first three five-year periods. Table 2 shows that in the Science Direct and Google Scholar databases the representation of the publications in which the selected concepts appear together is constantly growing to this day. This also shows the connection between ERP and other large systems with selected concepts, but in the last five years there has also been a noticeable expansion of considerations related to big data and embedded analytics.

	Web of Science Core Collection - Search by Topic						Science Direct- Search by Title,abstract,keywords						Google Scholar- Search all excluded citations and patents					
Topic	1991-1995	1996-2000	2001-2005	2006-2010	2011-present	Tendency	1991-1995	1996-2000	2001-2005	2006-2010	2011-present	Tendency	1991-1995	1996-2000	2001-2005	2006-2010	2011-present	Tendency
Decision Support	1980	2857	3823	6505	11303	⇧ 1	1022	1137	1456	2471	4545	⇧ 1	18600	33200	92000	224000	154000	⇩ 0
Enterprise Resource Planning	2	54	264	350	380	⇧ 1	0	11	122	137	217	⇧ 1	132	3160	14900	20400	17600	⇩ 0
Business Performance Management	0	0	2	6	9	⇧ 1	0	0	1	0	7	⇧ 1	30	109	860	2410	3590	⇧ 1
Business Process Management	6	31	91	172	309	⇧ 1	0	7	32	65	186	⇧ 1	266	1270	7310	17000	17700	⇧ 1
Business Process Reengineering	73	159	90	60	54	⇩ 0	25	104	57	29	44	⇩ 0	1130	6350	9840	13100	14100	⇧ 1
Supply Chain Management	22	243	1028	2337	3592	⇧ 1	4	78	446	876	1458	⇧ 1	1480	9340	26400	57900	57500	⇩ 0
Customer Relationship Management	0	19	224	381	520	⇧ 1	0	7	104	137	223	⇧ 1	468	2840	16400	20100	26200	⇧ 1
Business Intelligence	6	26	104	184	462	⇧ 1	2	5	52	68	338	⇧ 1	614	2150	12700	16600	23400	⇧ 1
Data Warehouse Or Data Warehousing	7	247	503	524	682	⇧ 1	32	481	1565	2176	3963	⇧ 1	47	2460	5920	9250	10400	⇧ 1
Data Mining	27	944	3924	5751	8962	⇧ 1	10	190	962	1889	3772	⇧ 1	4010	19300	169000	463000	238000	⇩ 0
Text Mining	0	33	330	777	1687	⇧ 1	0	2	66	233	644	⇧ 1	63	827	8670	19300	20900	⇧ 1
Web Mining	0	14	155	173	185	⇧ 1	0	1	29	64	82	⇧ 1	16	461	5850	12300	16300	⇧ 1
Business Analytics	0	0	3	13	99	⇧ 1	0	0	1	5	50	⇧ 1	11	32	423	1590	10400	⇧ 1
Knowledge Management	42	447	1783	2470	3111	⇧ 1	28	149	541	648	1107	⇧ 1	3820	16000	127000	205000	102000	⇩ 0
Knowledge Discovery	48	441	880	897	1183	⇧ 1	6	108	208	310	454	⇧ 1	1430	10400	25800	50900	53600	⇧ 1
Big Data	0	0	0	26	3946	⇧ 1	0	0	0	4	1689	⇧ 1	0	0	721	2060	32200	⇧ 1

Table 1. The frequency of appearance of selected topics from 1991-2016

	Science Direct-Search by Title,abstract,keywords						Google Scholar- Search all excluded citations and patents					
Combination of topics	1991-1995	1996-2000	2001-2005	2006-2010	2011-present	Tendency	1991-1995	1996-2000	2001-2005	2006-2010	2011-2016	Tendency
"ERP" and "Decision support"	0	4	37	67	89	⇧ 1	124	999	5690	10400	15300	⇧ 1
"ERP" and "Business performance management"	-	-	-	-	-	-	2	9	171	639	806	⇧ 1
"ERP" and "Business process management"	0	0	0	0	2	⇧ 1	24	189	2330	6750	10200	⇧ 1
"ERP" and "Business process reengineering"	0	0	8	9	52	⇧ 1	14	544	2710	3870	4170	⇧ 1
"ERP" and "Supply chain management"	0	3	45	49	63	⇧ 1	95	1450	9780	15200	16800	⇧ 1
„ERP“ and „Customer relationship management“	0	4	66	71	106	⇧ 1	33	590	6130	10000	13200	⇧ 1
"ERP" and "Business intelligence"	0	1	33	39	68	⇧ 1	22	310	3220	6400	11300	⇧ 1
"ERP" and "Business intelligence" and "Decision support" and "Supply chain management" and "Customer relationship management"	0	0	16	21	52	⇧ 1	1	18	328	585	965	⇧ 1
"ERP" and "Business performance management" and "Business intelligence" and "Decision support" and "Supply chain management" and "Customer relationship management"	0	0	0		1	⇧ 1	0	0	10	65	86	⇧ 1
"ERP" and "business process reengineering" and "business intelligence" and "decision support" and "supply chain management" and "customer relationship management"	-	-	-	-	-	-	0	7	70	110	140	⇧ 1
„ERP“ and „big data“	-	-	-	-	-	-	0	70	129	226	5180	⇧ 1
"ERP" + "embedded analytics"	0	0	0		13	⇧ 1	0	0	6	34	50	⇧ 1

Table 2. The frequency of simultaneous appearances of combination of topics from 1991-2016

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The following text includes Table 3 obtained by meta analysis of research (for details see research in Halper, 2015) [17], sorted by categories from the top down: the first category represents concepts that are anticipated to decline in use over the next three years, and the remaining two categories indicate concepts that will be moderately more and much more used in the next designated period. This view of emerging trends and technologies is clearly essential for reflection and selection of a combination of business software suite, BI modules and types of analytics, platforms and ways of implementation in order to exploit the potential of each and the total potential of all of them in a given company.

Data Types Used for Operationalizing Analytics	Statistics of today's use	Will use for 3 years from now
Structured data(tales,records)	90%	8%
App logs	24%	36%
Real time messages	30%	46%
Web logs and clickstreams	21%	40%
Machine generated data	20%	39%
Data from graph databases	15%	32%
Social media data	22%	47%
Streaming, real time continous data	16%	46%
Unstructered data(audio video, text)	15%	48%
Analytics Used for Operationalizing and Embedding	Statistics of today's use	Will use for 3 years from now
Reporting	89%	9%
visualisation	69%	26%
Optimisation	28%	51%
Predictive analytics	28%	59%
Geospatial analytics	17%	37%
What-if simulations	22%	57%
Social media analytics	17%	46%
Prescriptive analytics	18%	51%
Text analytics	15%	45%
Platforms Used for Operationalized Analytics	Statistics of today's use	Will use within3 years
Data warehouse	74%	19%
Other databases or data marts	73%	14%
BI and analytics platforms	73%	24%

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Transaction systems	59%	16%
Operational data stores	53%	23%
In-memory analytics platforms	31%	38%
Open source platforms	22%	25%
Data appliances	19%	32%
Public cloud platforms	19%	39%
Native mobile platforms	15%	29%
Hadoop	15%	39%
In-memory grids	13%	27%
Event stream processing engines/	12%	29%

Table 3. Data Types, Platforms and Analytics Used for Operationalizing Analytics

Conclusion

This paper presents an overview of the field with the aim of systematically linking important areas, approaches and philosophies whose understanding is necessary for successful implementation of ERP and/or SCM and/or CRM system and the establishment of effective systems for decision making support. During operation described are some issues related to the non-exploitation of potentials and non-integration of large systems, sub-optimal use of analytical tools, lack of new technological solutions, lack of understanding the phenomena big data and the like. The paper therefore proposes a set of guidelines and tips that to bypassed or eliminate these problems.

Chapter which systematically presents the concept of the affected area from selected literature has been upgraded in content around the central concept of the ERP systems. Gradually upgrading with other terms and concepts is done through their description and interpretation of the function and connecting them in relation to the ERP system. Each concept has been given a position, purpose and relationship with other areas in a continuous system of managing business performance. In doing so some guidance in terms of using new technology storage, retrieval and analysis of data has been given.

Also presented was the frequency of appearance which may also be used to monitor the development and character of processed concepts, and thus demonstrating the need to also consider their mutual relations and not just the concepts individually. Meta analysis has produced graphs that describe the anticipated development of certain technologies, types of data, analytical tools, and highlights those that are anticipated to decline in popularity and the ones that will be more and more used in the next few years. This concise view of future trends is also important in the assessment criteria for the selection of software, tools and types of implementation. This paper is intended to gain insight on the complexity of the field of business management and exploitation of the full potential of software packages that are offered today in the market in order to find the best combination for a given company. The further course of research would

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go into setting up a comprehensive framework which sets the basic structure and configuration of the business suites and after that to create a support system in the selection of such a configuration.

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Category: review paper

Gutic Martincic Sanja [1]

Emotional Intelligence: A Model of Pluricentric Emotional Dispersion of Those Involved in Change Management Within a Work Organisation

Abstract:

During work one is striving to contribute towards the modelling of emotions of the employees and the dispersion of their emotions as an inevitable process in the creation of positive emotional contagion upon effective change management within a work organisation. Whilst aiming to point out the vast array of the employees' emotions, the paper provides a broader approach comprising of 11 forms of organisational behaviour which are more or less affected by the emotions of the employees. The focusing of emotional intelligence has been performed through four components: self-awareness, self-management, social awareness and relationship management. Each organisational change results both in positive and negative emotions amongst the employees. These emotions have been presented in the paper according to different phases of organisational change. It has to be highlighted that one of the most difficult and most complex problems in the management of the employees' emotions during organisational change is not the identification of emotions, but how to enhance positive emotions amongst a proportion of the employees. Subsequently, how to transfer or disperse them towards other members of the working group and the entire work organisation.

Keywords:

emotions; emotional intelligence; organisational change; emotional dispersion

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Introduction

Emotional intelligence is a topic that has been increasingly and more frequently arousing interest both of the scientific and professional public within the contemporary management. Emotions are a characteristic that separates humans from animals. Moreover, being innate, emotions continuously accompany human personalities and appear in all everyday life situations, as well as at work. They are powerful drivers of a large number of psychological functions of humans. A wide range of research studies conducted during the last 15-odd years have provided us with findings which state that emotions and the management of employee emotions can result in productive management of a large number of processes inside business organisations. Emotional intelligence, as a systematic approach to management, is important also in the sphere of change management within business organisations. It is a well-known fact that emotional resistance of employees to organisational change and its implementation is actually one of the most challenging fields. This paper is striving to contribute to modelling of employee emotions and pluricentric emotional dispersion, as an indispensable and productive course of creation of positive emotional epidemics (contagion), which is necessary in effective organisational change management.

Emotions in the workplace and emotional intelligence

Approaches and classifications of emotions that appear in the workplace show considerable differences. Hence, according to Poggi and Germani, there are five types of emotions: individual emotions, cognitive emotions, emotions of belonging, emotions of independent perception and other emotional conceptions [16]. Kraus expanded the range of emotions that can be considered as crucial at work [10]. These are:

1. Passion, a strong and hardly controllable emotion that incites beliefs, trust, motivation and loyalty amongst employees.
2. Compassion (empathy) as the ability to understand and share feelings with another person. It is a valuable emotion in the building of organisational culture.
3. Loyalty is an emotion for building of fidelity to a person, a job and an organisation.
4. Fury or anger resulting from a perceived injustice, inequality, dishonesty, workplace mobbing.
5. Enthusiasm is defined as impatient intense pleasure focused on a specific interest. As an emotion, it is significant upon inciting creativity and innovativeness amongst employees and upon project management.
6. Doubt and fear are emotions of bipolar character, since they can cause both negative and positive responses. Doubt is a feeling of insecurity.
7. Happiness or a feeling of happiness leads towards positive outcomes in organisational behaviour. It differs from the concept of satisfaction, as satisfaction is an equivalent of happiness.
8. Satisfaction is a state of happiness that is reflected through gratitude and employee loyalty.
9. Curiosity or curiousness is a tendency to become acquainted with something, to explore and learn. It frequently appears as a result of some dissatisfaction. It is an important emotion in creativity management.
10. Ambition, as opposed to curiosity, is an emotion that inspires work. Determination and preparedness for hard work, doing tasks and tackling obstacles are its features.

Robert Plutchik was probably the person that has provided the most comprehensive classification of emotions. He provided the well-known "wheel of

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emotions" which shows that all the emotions originate from six primary emotions, from which secondary and tertiary emotions develop [15]

Emotional intelligence, as a product and construct based on emotions, can be defined as a mental ability or a set of mental abilities, which enables recognition, learning, memory and the ability to think. According to Mayer, emotional intelligence is a notion that is on a par with pure intelligence or cognitive ability of an individual [13]. As opposed to him, Bar-on Reuven considers emotional intelligence as a mixed intelligence that comprises of cognitive abilities and personality [1]. On the other hand, Mayer et al., defined emotional intelligence as the ability of accurate evaluation and expression of emotions… the ability to approach and generate feelings in order to facilitate the verbalisation of thoughts [13]. Goleman has thus far probably made the most significant contribution in the field of management of emotional intelligence. He perceived emotional intelligence as a mixed intelligence that includes cognitive abilities, as well as a large number of abilities and aspects of personality [9]. Moreover, he focused emotional intelligence through four components: self-awareness, self-management, social awareness and relationship management.

Organisational change and employee emotions

The question whether organisations need to undergo permanent change in accordance with the requirements in their environment is absolutely not contentious against the backdrop of modern times. It is a fact that nowadays all the organisations that strive to survive and remain competitive need to undergo continuous changes. What they need to focus their energy and knowledge on is the most effective way in which to implement these changes. Each organisational change is a challenge and an opportunity. Furthermore, it can trigger a wide range of positive emotions amongst the employees. Nevertheless, it can also trigger a large number of negative emotions, since people are by nature afraid of the unknown. According to phases in organisational change, these emotions can be illustrated in the way presented in the table hereafter (Table 1).

A phase of organisational change	Negative employee emotions	Approximate orientative meaning of employee emotions
Initiating change	grief	Why are we abandoning the existingstate-of-affairs?
	fear	What will happen with me and my job?
	doubt	Will I be able to learn the new?
	bitterness	Why is the management doing this to us now?
Transition onto a new state of affairs	insecurity	In what way will all of this affect me?
	rage	Do I need to put in so much effort to master all this?
	agitation	Who knows what else I will have to face?
	envy	Why are the others doing better at fitting in into a new job?
	contempt	We are only a means for the generation of higher profits
	despair	I am a total failure in this new organisation
	remorse	That is just what I needed when I showed such blind belief in these new changes to the management

Table 1. Features of the most frequent negative employee emotionsaccording to phases in organisational change

Pluricentric emotional dispersion

The problem of how to enhance and transfer or disperse positive emotions to other members is probably one of the most difficult and the most complex problems during organisational change implementation.The currently available findings point out the ways of dispersing these emotions from individuals to the entire group and work organisation [3]. The term "dispersion" has been used, since emotions are similar to gases: they are hardly visible and have the ability to affect all the people in one place in a specific moment [14]. According to a comprehensive research of the structure of groups undergoing change, a frequent ratio within a group was as follows: 70% of emotions comprising of fear, 10% contempt, whilst 20% curiosity, or positive emotions [4].

Emotional contagion (as it is frequently referred to) is a mechanism of spreading positive emotions from an individual towards all the members of a working group. The basis of this psycho-mechanism is a human, innate inclination to gladly adopt the emotions of other people in one's environment [8]. Why is pluricentric emotional dispersion necessary? What does it mean? Emotional dispersion from one source (centre) that has thus far almost exclusively been implemented frequently does not provide the expected results. That is primarily because people in organisations are a heterogeneous rather than a homogeneous group. Consequently, emotional dispersion from several homogeneous groups brought together into different employee segments [7] is considerably more effective and productive.

Pluricentric emotional dispersion within working groups and organisation as a unit comprises of at least six connected and interdependent phases:

1. In order to achieve emotional dispersion, a specific level of emotional intelligence amongst organisational members needs to be achieved. From the structural aspect it has been shown through four elements: self-awareness, self-management, social awareness and member interaction.
2. Emotional dispersion originates from several centres (sources of positive emotions, individuals, group members). They have been referred to by using upper-case letters in the picture.
3. Identification of the level and the form of heterogeneity of organisational members and defining of emotional segments.
4. Emotional dispersion in the narrow sense of the word amongst members of a group/organisation.
5. Emotional dispersion achieves a required level of emotional temperature in an organisation. It is required to provide a background for the development and creation of emotional contagion.
6. Emotional dispersion achieves a required level of emotional temperature in an organisation. It is required to provide a background for the development and creation of emotional contagion.
7. Emotional contagion amongst working group members (marked in lower-case letters in the picture) and the organisation as a unit is the final purpose and scope of emotional intelligence management.

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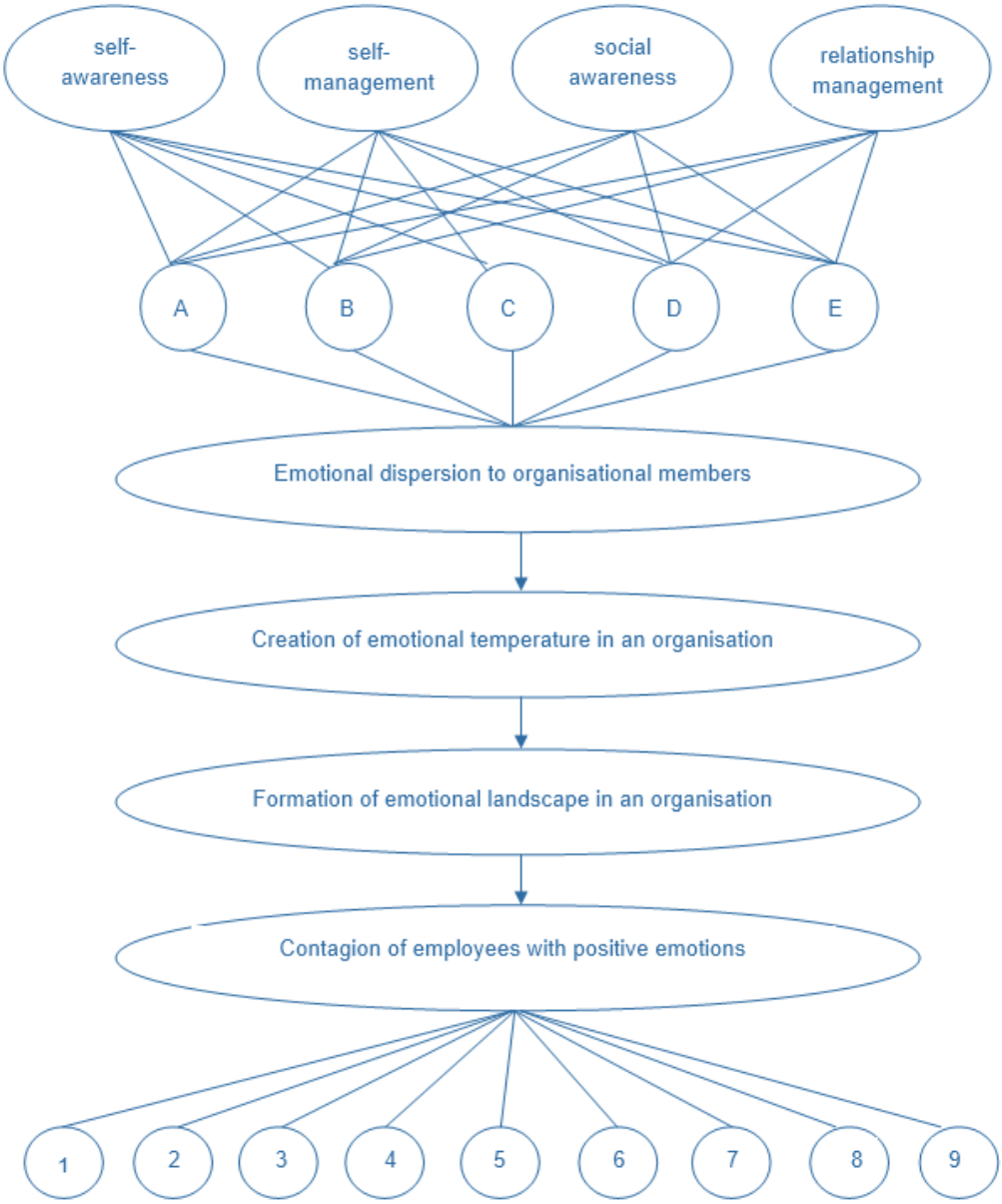

Figure 1. Phases of pluricentric dispersion of employee emotions in a business organisation

These phases have been presented in picture 1.

In order for the model of pluricentric emotional dispersion to function, sources (centres) of dispersion of positive emotions focused on organisational changes need to develop all the four elements of emotional intelligence, as it has been previously stated. In other words, emotional awareness needs to develop. Everyone with developed emotional awareness will be capable of dispersion of positive emotions about organisational change to all organisational members.

Once this dispersion has been achieved, an emotional landscape will be formed in the organisation that will provide a fertile background forthe creation, growth and strengthening of emotions amongst employees concerning change [2]. Contagion of employees with positive emotions arises out of this landscape and it spreads to all the organisational members. The state of emotional contagion is not easy to achieve. Upon initiating organisational changes only a proportion of employees most frequently has positive emotions and emotional flows towards these changes. Most of

them either do not have them at all or have negative emotions [5]. An increase in positive emotions needs to be achieved through emotional climate prior to emotional dispersion. This is achieved through a wide range of techniques and training sessions intended for identification of emotions. Amongst the proportion of employees who have negative emotions towards organisational changes, additional work will be required, focusing on easing the burden of negative emotions on these employees through their identification and training sessions intended to eliminate such emotions [6]. This has been illustrated in picture 2.

Identification, strengthening and easing of emotions characterise the phase of initiation of change. Emotional dispersion is typical of a phase of change implementation, whereas emotional contagion is a feature of the phase of cementing (strengthening) of the implemented organisational changes.

Model of pluricentric emotional dispersion in organisations whose objective is greater effectiveness in organisational changes has been presented in picture 3. It comprises of the following elements:

1. Identification of positive and negative emotions, strengthening of positive and easing of negative emotions of the employees,
2. Creation of emotional temperature in an organisation,
3. Emotional dispersion from four hypothetically placed centres of homogeneous segments of employee emotions,
4. Creation of emotional contagion as the ultimate purpose of emotional intelligence management in business organisations.

The presented model is of theoretical and hypothetical nature and it is intended to provide an explanation of processes and interdependence of effectiveness of changes and impact of employee emotions on these changes.

Implementation of the model

A large number of reputable international companies have thus far effectively implemented different emotional intelligence models in change management. It is important to mention Avon, American Express, Boeing, Hilton, Honeywell, Johnson & Johnson, L'Oreal, Motorola and MetLife, to name a few. There is a wide range of advantages to the model of pluricentric emotional dispersion, presented in this work compared with the emotional intelligence models normally implemented thus far. The previously mentioned advantages primarily comprise of:

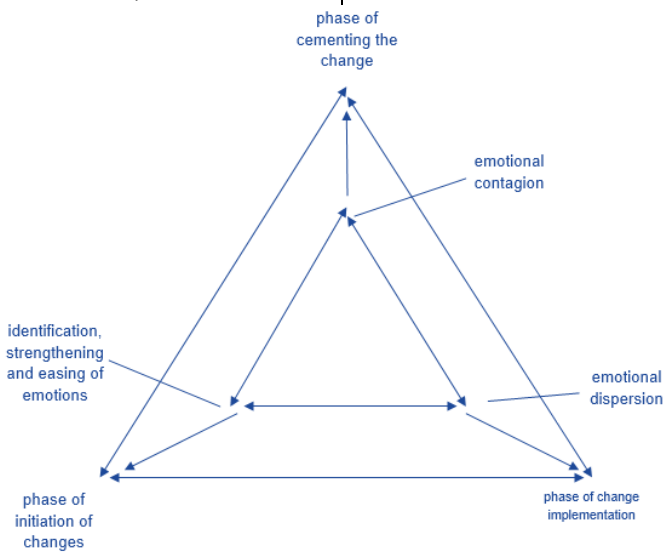

Figure 2. Phases of organisational change and emotional intelligence management

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1. Identification processes of employees are more effective and realistic due to homogeneity of members within the segmented working groups,
2. Transferof emotions from an individual (individual emotions) to emotions of other members within the group (social emotions) is faster and with a lower perceptual selection.
3. Emotional temperature within working groups, and hence at the organisational level, is reached faster and longer lasting results are achieved.
4. Emotional stability of groups at the organisational level is higher and more reliable.

Nevertheless, upon implementation of the proposed model the following conditions and assumptions need to be considered:

1. Organisations need to have a developed, modern and adequate human resources system [12],

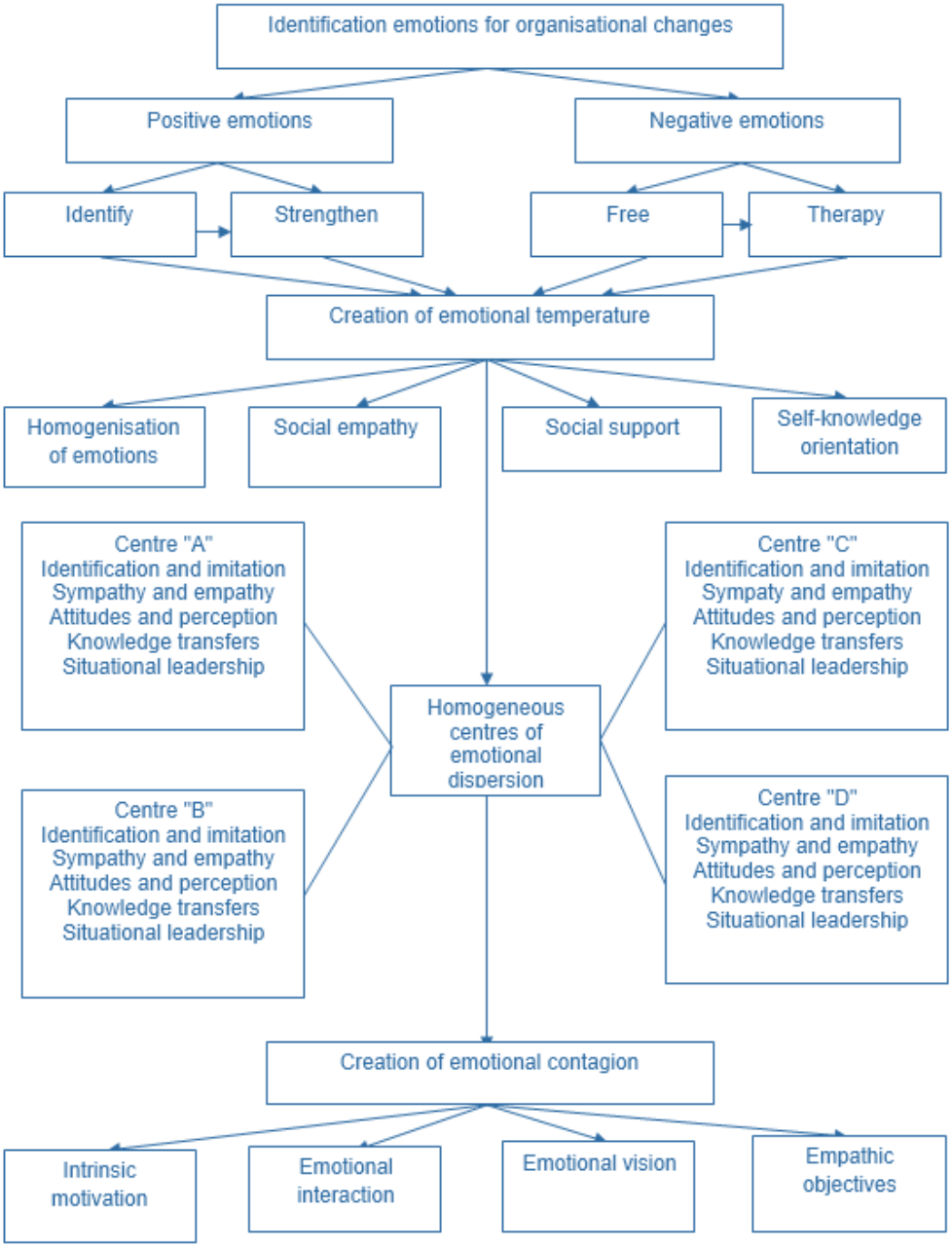

Figure 3. Model of pluricentric emotional dispersion

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2. Management in the organisations that are striving to implement emotional intelligence needs to be adequately trained in this segment, primarily through training programmes on emotional intelligence.

3. Management in the organisations that are striving to implement emotional intelligence needs to be adequately trained in this segment, primarily through training programmes on emotional intelligence.

4. Human resources leadership needs to be based on one of modern models such as transformational leadership model [11].

Implementation of the model of pluricentric emotional dispersion is inconceivable without highly educated multidisciplinary teams.

Conclusion

This paper addresses several issues. It primarily aims to present the value, complexity and importance of employee emotions in business organisations concerning the roles and the assumption of roles by the employees during organisational changes. This is because both theory and practice have thus far pointed out the fact that problems and employee resistance to organisational changes occur primarily within the sphere of negative emotional flows amongst the employees. Management risks and questionability of effective implementation of organisational changes increase substantially in the absence of understanding of these emotions and unless the prerequisites of emotional intelligence management have been adopted. The model of pluricentric emotional dispersion has been presented as a contribution of the author in this paper. The initial idea behind the model is in diversity and heterogeneity of emotions and emotional flows amongst employees. Consequently, accessing emotional intelligence management through segmentation approach or through several homogeneous employee groups is considered effective. The model of implementation of emotional intelligence is primarily based on effectiveness of emotional dispersion from individuals to other working group members. The model proposed in this paper can enable the management to reduce risks upon organisational change, improve the processes and increase the effectiveness of organisational change.

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PHOTO 3.
Kužni pil | Monument
PHOTO BY: JOSIP MESIĆ

Category: review paper

Samardzija Luka [1]
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Kuzmanovic Sinisa [3]

Analysis of Buying Habits - Wine Segment

Abstract:

On a market with high supply offer segmentation cares extremely high importance. Wine is characterized as highly complex product and possibility of segmentation is extremely large. To insure detailed analysis it is essential to take in count all starting points of segmentation. Demographic factor can help with the analysis but wine as a product demands as specific approach as possible to ensure relevant conclusion.

Wine promotion and market communication without detailed analysis based on a market segmentation cannot give any reliability for a success. Market acknowledges high segment of bought buyers profiles and product offers. To meet bought wishes communicating with buyers is essential.

Keywords:

Wine; marketing; promotion; sale; segmentation

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Wine marketing

The law recognizes wine as an agricultural food product obtained by complete or partial alcoholic brewing of mulch from fresh and for processing ready grapes [1]. It is a complex product that can independently satisfy needs of a consumer but equally complement the other products. Purchase can send equally strong message of opposing social status (from deviant behaviour to luxury). For centuries present this product diversifies itself from the same products on a highly competitive market. Although the technological process of production is largely standardized, small changes in production (breeding, storage) can make big differences in final production.

Wine supply market recognizes a high level of competitiveness. High choice in offer reduces the time a customer is willing to dedicate to the individual brand, so manufacturers are forced to further diversify their product (compared to other brands) with intent to attract consumer attention. To achieve better market communication standardized elements of a promotional mix can be used by producers to gain as best market position as possible.

Marketing is a process that begins with the idea of need and ends with the feeling that a user achieves by satisfying his desires. It is traditionally divided into four components (product, price, distribution, promotion) and the ultimate goal is to strive to meet customer and manufacturer needs at the same time. Success can be measured by compering costumer experience ageist their opportunity cost. The notion of marketing is often identified with its basic component of promotion, which is by no means true. Promotion makes just one quarter of total marketing mix and its purpose is to enhance communication between the manufacturer and the buyer, boosting the interest in the product with the aim of increasing consumer engagement when choosing. The most important component of involvement is precisely the interest in the product itself and with the higher interest from the consumers, its involvement in making the purchase decisions, related to particular product, is higher [2].

In order to meet the customer's needs with the goals of producers marketing strategy relies on its basics elements (known as a marketing mix) that include marketing strategy elements over which the enterprise has control[3]. As noted earlier, wine is a highly complex product that competes in a highly completive supply market. To unfamiliar customer differences between products can be almost imperceptible and wine can be a perfect substitute to its self. In order to make probability of market analyse more relevant, regarding advantages and disadvantages of individual product and its comparative advantage of communion with a customers, it is essential to divide entire market to more compact homogeneous segments.

Segmentation

The term segmentation of the market implies the task of dividing the overall market (which is usually too large for serving) on segments that have common features [4]. The purpose of the segmentation is to centre the focus of the analysis, reducing the total amount of possibilities on to a logical units with the aim of achieving a more lucrative perspective. This approach to market research results with a higher level of precision and by combining deduction and induction method of analysis it gives more practical conclusions. It is necessary to differentiate the concepts of market research and market monitoring. Market research, in the narrow sense, means a process with a specific goal while market monitoring implies a continuous collection of data in order to analyse the current state[5].

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Approach to segmentation can be accessed from several different starting points, depending on the end goal of the research. For example segmentation can be made on a market or the product, production goods or the services, supply or demand etc. Regardless of which criteria is being used, regardless of starting point in observation and analysis, the conditions of measurability, differentiation, comparison and grouping must be met. This makes basic criteria of any segmentation process.

Acknowledging more homogeneous units of the observed group with the aim of analysing and making relevant conclusions is further complicated by the fact that the final decisions are driven from the complexity of human personality. The purpose of market research is to define target groups of consumers towards which, ultimately, communication is directed. Most often, consumers are divided by demographic parameters (gender, age, education, place of residence, work status, etc.) through which the benefits and disadvantages of the product or market are further analysed.

Elaboration of the segmentation and the choice of the target market clearly suggests that the high quality segmentation, carried out in a professional sense, according to the appropriate rules and procedures, and the proper selection of a market segment where the company can be more successful than others, is the main starting point in the process of creating more favourable market positions in competitive environment [6].

As previously emphasized, wine is essentially complex product in its essence, and if we add challenges posed by the market competition it is clearly imply that segmentation, with the goal of achieving the better market position is indispensable. Analysis of wine offer market can be accessed from the position of producers, customers, trades, crafts, and the like. The starting point of weaving overall market has too many variable for listing and it depends on the ultimate goal of one that is making segmentation analyses.

One of the basic divisions, though perhaps not the most common in practice, is the dividing wine using Wine Law:

1) wines in the narrow sense of the word: (still wine, sparkling wine, pearl wine)

2) specialty wines: (desert wine, aromatized wine, liqueur wine)

Insight into the literature has shown that this commodity is most often recognized by the origin of the country (foreign, domestic), the origin of the producer (region, sub region, vineyard), color (white, red, rose), quality (table quality, top quality), sugar content (dry, semi-dry, semi-sweet, sweet), grape varieties (Graševina, Malvazija) etc. These differences are only a part of the possibilities in market segmentation of wine and observed only from the product point of view.

This product can also be analyzed from a consumer perspective. The market can be divided according to demographic metrics, preferences and motivations of purchase and consumption. According to earlier research, we found a breakdown according to the description of wine consumers [7].

Prestigious consumers	high purchasing power and high brand susceptibility
	urban men and women - 30 to 40 years
	make up 2.4% of the total market and are often consumers of wine
Experts	high purchasing power and average brand sensitivity
	urban men aged 45 to 55, married with children

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	account for 6.2% of the total market
Traditional consumers	average purchasing power and the average sensitivity to the brand
	equally urban and rural men and women, 30-55 years old, married with children
	largest segment in continental Croatia is 41% of the total market
Hedonists	average purchasing power and great brand sensitivity
	younger urban women aged between 25 and 35 without children
	make up 8% of the total market
Saver	average purchasing power and low sensitivity to the brand
	urban and rural men and women, 40-50 years old, married with children
	make up 37% of the total market
Modest	low purchasing power and low sensitivity to brands
	inhomogeneous group - two subsystems:
	younger population - students
	old retired men
	make up 5.4% of the total market

Table 1. Segmentation of the wine market in continental Croatia

In such a thick system of choices, we differentiate between buyers who have earlier preferences for certain brands, and those who decide in a financial opportunities, those who are motivated by additional conditions (if they buy for the purpose of gift giving, complementing dishes, and celebrations).

Research methodology

The survey was conducted on the principle of online questionnaire using LimeSurwey platform. The geographic factor was neither a precondition nor a factor of conditionality. Participants were those who consumed wine and are of age (more then 18 years old). Both sexes had the same opportunity to be represented.

The questionnaire is composed of two parts. The first part is related to the demographic issues. The second part of the questionnaire referred to preference when selecting wines for a purchase. Questions are formed to gain insight into the part of the purchasing habits of people who enjoy this product.

The questionnaire consisted of selecting answers on the principle of one option, multiple possibilities and Likert scale. Elements of descriptive statistics were used as analysis method. Data analysis was observed through central tendency measures using Microsoft Excel.

A total of 79 respondents participated in the survey questionnaire, of which 8 did not fully complete the questionnaire. In order to minimize the possibility of error in the analysis, we used only fully completed questionnaires.

Research

The survey questionnaire was fully completed by 71 people. Of the total number of surveyed participants, 35 were female and 36 male subjects. The distribution of respondents by age showed that the largest cluster belongs to grades between 26 and 35 years and 36 to 45 years.

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18- 25 years	7,46%
26- 35 years	41,79%
36- 45 years	31,34%
46- 55 years	8,96%
56- 65 years	7,46%
66 + years	2,99%

Table 2. Distribution by age

Total of 58 respondents are currently employment whereas 13 of them, at the time of the survey, were not employed.

When asked "How often do you buy wine?" A total of 46.48% of respondents stated that they only purchase it in special occasions while in second place (35.21%) stated answer was that their monthly frequency of wine buying was the most frequent.

Daily	5	7,04%
Per week	24	33,80%
Per month	17	23,94%
Only on special occasions	25	35,21%
No answer	0	0,00%

Table3. How often do you consume wine

Daily	1	1,41%
Per week	7	9,86%
Per month	25	35,21%
Only on special occasions	33	46,48%
Other	5	7,04%
No answer	0	0,00%

Table 4. How often do you buy wine

Analysis of how often respondents consumed wine 25 (out of a total of 71) showed that they only enjoy it on special occasions while only one respondent less shows weekly consumption of this product.

Purchasing channels for buying wine showed that just over 81% of the respondents uses the super market offer, 35.21% directly buy it from the manufacturer, while the two of them use on-line procurement system. Rubric "Others" showed that wine is most often receive as a gift from business partners.

Cluster of questions: "When buying wine (for personal needs) what are you paying attention to?" answers was offered in Likert's scale (1-it does not matter to me, 2-proportionally It has a little importance, 3- It has nither some of none importance, 4-proportionally it has importance to me, 5-It's important to me).

A total of 52.11% respondents stated that price during the selection was relatively important. The price class that is most often chosen by respondents with 52.11% of total answers is the one up to 50 kuna while the second place with 46.48% is up to 100 kn.

The division of wine by the quality (table, high quality, top quality) for 52.11% of respondents makes a relative importance, while on the question "The division of wine by color (black, white, rose)" as a very important characteristic when wine selection is being done had as high as 73.24 % of respondents.

A high level of sensitivity to domestic production was reported by 95.77% of respondents (indicating that they prefer domestic production), which is consistent with the answers to the question of preferences related to the origin of wine (domestic or foreign) - as extremely important for many as 77.46% of respondents in favour of domestic products.

Appearance and design of labels proved to be not so relevant factor when selecting wines. "It does not matter to me either, nor does it matter to me"

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answered 30.99, while the answer "proportionately important" to 38.04%.

The question "Which wine packaging you prefer" shows the response that 77.46% of respondents prefer bottled packaging in 0,75 litter volume.

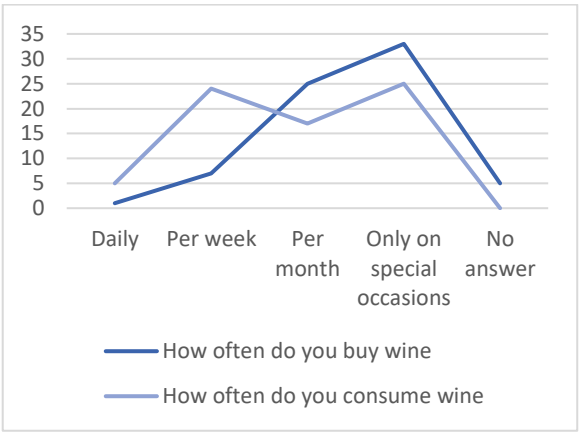
Discussion

The economic branch of grape and wine production in the Republic of Croatia has a century-old tradition. The high level of knowledge and competence by wine producers, the positive climatic conditions for vine production and the freedom of imports (with membership in the European Union) enable a high level of wine offer in a Croatian market. All market participants, under the aforementioned conditions, strive to maximize their product and through marketing mix to improve their communication with customers. At the level of such a high offer, it would be unwise to expect that customers will remain long-term loyal to one brand so producers need to put continuous efforts to keep focus of the consumer on their product.

By making analysis of buying habits in the supply and demand segment of wine it can be possible to understand customer preferences. Market segmentation facilitates the selection of communication resources with customers while market research allows predicting and / or tracking trends in the market.

The aim of this research was to obtain indicative parameters describing habits when buying wine. Through the analysis of the survey questionnaire we gained insight into the general motives that make the customers aware of this product.

Indicative is the partial disproportion of buying and consuming frequency of wine. It has been shown that respondents usually consume and buy wine on special occasions. The answers are matched in this segment until the secondary cluster shows significant disagreement and there is a significant weekly consumption but a monthly purchase.



Picture 1. Compare Purchase and Consumption

The importance of buying and consuming wine on special occasions has promising features for a more detailed future research.

Retail chains have proven to be the most convenient distribution system for customers. The surveyed wine consumers have shown that they are most likely to decide on this wine procurement system, even though there is a relevant segment (between analyzed respondents) of buying directly from the supplier. While we live in the era of digitization and developed e commerce surprisingly low purchase level using the on-line purchase system. Analyzing this response group opens the possibility of additional research with the aim of inspecting motives for avoiding on-line purchasing and / or resorting to purchasing in the retail system.

According to previous research, it was confirmed that wine consumers prefer domestic production in comparison with import wines. It has been proven that there is a preference and motivation to select wines from domestic production, but only if they match the quality with foreign competitors [8]. More than three-quarters of the respondents expressed great importance when considering the origin of the producer and among all the respondents (in this survey questionnaire) indisputable preference of domestic producers was acknowledged.

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By analysing issues that responses placed on the Likert scale, one can get an insight into the motives that determine preference when purchasing wine.

	Price	Quality	Color	Origin	Design	Packing
It does not matter to me	0	3	2	4	6	6
Proportionally It has a little importance	10	2	5	3	13	8
It has neither some of none importance	17	12	12	9	22	13
Proportionally it has importance to me	37	37	24	26	27	28
It's importance to me	7	17	28	29	3	16

Table 5. Preferences when selecting wines

The importance when purchasing wine according to the color and origin of wines shows to be extremely important, while the importance of the qualitative division of the product take second place. The results are not surprising, and it is possible to conclude that the primary reference to customers is affinity according to the color of the wine. This motive could be further explored, but it is indicative that precisely this motif determines the initial starting point of the selection.

Conclusion

The questionnaire was not large enough to make general conclusions that can be applied to the overall market but the indications of its analysis are not questionable. This research can be used as a guideline for further detailed research and analysis. The significance of the food processing industry in relation to the total processing industry is reflected in the fact that even about one quarter of the value of the indicator refers to the food processing industry: the number of persons employed (24%), turnover (32%), added value %), gross operating surplus (30%). The number of enterprises in the food processing industry is 16 percent compared to the total manufacturing industry[9] . The expressed affinities towards wines derive from domestic production, while the emphasis on price, color and product qualitative sensitivity can be used as a guideline for market decision making.

Market segmentation and diversification of products in the high offer system are necessary for manufacturers that want to sell their products more easily. The lack of online shopping preference indicate that the buyer are still relenting on sensations (by sight) when choosing a wine. Keeping in mind these parameters, manufacturers can further work on the position of their products on the retail shelving system.

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