Integrated manufacturing system framework for sustainable maritime tourism

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Abstract. The opportunity to bring a new product in the market has been understood as the key value to win the global competition. To offer a different product, several steps should be taken such as identify the customer need or wants, analyze the product value, knowing the supply chain, producing the innovation and feel the market sustainability. These steps are taken as a part of value chain analysis. Water resource is limited for certain area especially in coastal line that we called maritime area. Fresh water are widely taken to support the production process to be the raw material or supporting production activities. The option of bringing fresh water from other area is the common and easiest way. This, however, should be accompanied with the alternative method such as the use of rain water preservation. Surabaya has a significant development for its infrastructure and willing to a city with sustainable maritime tourism. A sustainable life style would be strongly beneficiary for achieving best long term benefit. To integrate all the factors, the purpose of this research is about building a comprehensive strategy to perform necessary value chain analysis and mandatory water management action as the community way of life. Thus, a sustainable maritime tourism concept can be designed based on choosing the right product, selecting the necessary process and designing the proper water management. An ultimate and sustainable method and design can be produced for the community.

1. Introduction
In this part, the research background, problem formulation, and research objective will be shown.

1.1. Research Background
Most of products that support maritime tourism in Indonesia made by local Small to Medium Enterprises (SME). Products made by SMEs have a unique product characterized by cultural traditions of each region. Entering global competition, the uniqueness factor can no longer be relied upon. Global competition requires many new factors, such as reliability, price, innovation, and environmental friendliness. GDP growth in Surabaya was 7.34% compared to West Papua (15.8%), Southeast Sulawesi (10.4%), West Sulawesi (10.3%), Maluku (7.8%), North Maluku (6.7%) and Central Kalimantan (6.7%) is an indicator of good economic competition (Badan Pusat Statistik, 2017). Eastern Indonesia has some great marine tourism potential with outstanding natural beauty. One of them is the potential of Tomini Bay which has 2,400.46 km of coastline (PresidenRI.go.id, 2017).
The potential of Surabaya is considered small, of course must be equipped with potential products in the form of unique goods and services and high profits. This comparison is not meant to create competition among regions in Indonesia. But to create an appropriate strategy map for Surabaya that has good industrial and trade potential, to be combined with marine tourism potential. In a better concept, Surabaya will be able to be a hub or supporter of marine tourism in other areas. Different strategy formulas for each region with levels of production process advantages, water management capabilities and natural potential advantages - will be able to generate maximum revenue with cost efficient expenditure.

Urban populations have recently owned more than half of the world’s population (United Nations 2014), particularly in developing countries. This creates the development of urban environment needs more attention than the rural environment. A high rate of urbanisation in Indonesia, as majority of other Asian countries, is on its way to have economic and environmental pressure to develop effective water, transport, and energy systems. As growing urban communities seek to minimise their impact on already stressed water resources, an emerging challenge is to develop robust city infrastructure and its resilient communities so that can adapt to the future uncertainties affected by population, climate and societal change.

Urban water management concept is designed to integrate water-related services, such as water resources and supply, municipal wastewater (greywater) reuse, sewerage and flood protection as well as green and liveable urban environments. Therefore, in order to implement the concept of urban water management, innovative technological approaches are required to ensure secure water supplies and protect water environments.

In this study, observations on maritime tourism in various countries will be conducted to identify business opportunities and environmental development strategies. Object of study in Surabaya is a case study to test the continuity of business and environment in the development of a maritime tourism area. Of course this will be done within the scope of the review of various maritime tourism policies which are currently limited to increased visits. Increased visits are promotional efforts through various activities such as Visit Morotai and Komodo, Banda Sail, Sail Indonesia and so forth. Further policies for product development and its integration with water management are should be planned in the framework of designing the production process and sustainable development.

1.2. Problem Formulation
Based on the finding above, the problem that will be solved in this research is how integration of product innovation supported by qualified production processes and water management is essential.

1.3. Research Objective
This research is conducted to have new product development and how to design the necessary production system. Further, this research contributes to addressing this challenge by assessing the potential contribution of alternative water systems in different location to increase water security/resilience while reducing pressures on traditional sources, improving sustainability in urban water management. Here is a preliminary note on the importance of this research.

1. This research seeks harmony between product innovation for the welfare of local people, efficient production process, and optimal water management as a support.
2. This research is aimed at experimenting the development of sustainable maritime tourism on an early scale and developed in various levels of natural beauty potential as well as local people's readiness in product making, where this area is still rarely done integratively. The existing research is a partial development of natural potential or commodity production process separately.
3. Integration between the development of business value, the production of service goods and manufacturing as well as good water management is an important key to the success of sustainable development.
4. Partnership with foreign countries, especially through ASEA UNINET is a mutually beneficial cooperation, with the expertise of European countries in the development of marine tourism and also the local potential of universities in the development of business processes, production processes (including the design of process-based automation of electronic systems) and environmental management is a tremendous investment that can help the city government of Surabaya

5. Cooperation of universities with Surabaya city government has been done very well in the last five years.

2. Method

In this part, research procedure will be discussed.

2.1. Research Procedure

The procedure of conducting the research is pictured in the Figure 1 below. The research begins with the sustainable maritime tourism concept design. Sustainable Maritime Tourism concept design will be discussed with stakeholders to put the criteria/factor to be considered. Literature review and benchmarking are taken in order to have combination of existing tourism overall aspect and maritime supporting aspect. Further analysis of demand and supply will be done as the balance of fulfill the demand with limitation of supply. The balance, then should be supported with the alignment of manage process, core process and support process as the component of completed production system.

Once the concept has been approved within several alternatives, an observation and survey to designated location will be taken. This can improved the assumption and obstruction of concept design to be extended to bring expected goals into reality. Focus Group Discussion as the next step is about multi player consideration for implementing the concept. The result, once again should be tested within the community, government and other business player as well through a concept preview and review.

Production process of new product development is focused on the expected tangible and intangible product. In other words, the product will not be limited on the existing product such as chips, smoked fish, etc – further will be extended with tourism service as the main product. The product itself will be further developed with several variant and equipped with marketing scenario both for customer segment and time to offer.

Fresh water system and waste water treatment system development is a combination set of preproduction system and post production system. Fresh water will be focused on how to deliver fresh water from outside area into desired location of sustainable maritime tourism. Meanwhile, the waste water treatment system is designed to be implemented better than end of pipe treatment and optimized for localized in the area.

The integration of production and water system (both fresh and waste water) might need several consideration and alteration. Although water is a supporting material, the production system will depend on the continuous supply of water and uninterrupted treatment of waste water as the responsibility of.

Community trial and review is taken as the developed system will be a new challenge for local people. The previous culture and way of life, somehow will be affected. The potential change might have risk for changing the way of thinking to absorb the designed system. Trial is important to see the effect and impact toward community prosperity and steadiness.

To summarize this research, a conclusion toward the overall system development will be recorded as the initial step of future sustainable development. A complete drawing of sustainable maritime tourism is both for research exercise and technical practice that should be improved for more powerful impact. Therefore, a set of recommendation for future development is needed.
3. Result and Discussion
In this part, strategy and development of urban water management and integrating production process and urban management will be presented.
3.1. Strategy and Development of Urban Water Management

Strategy that can be applied in order to design appropriate sustainable urban water management may include as follows, (1) Minimizing the distance of water and wastewater transportation, (2) using stormwater from roofs, preferably for water supply, instead of infiltrating or discharging it, (3) preventing from mixture of the human food cycle with the water cycle. Keep separating wastewaters of different origin, (4) designing decentralize urban water systems and do not allow human activities with water if local integration into the water cycle is not possible, and (5) increasing the responsibility of individual humans for their impacts on local water and wastewater systems.

Cities produce large quantities of wastewater and other forms of waste. Where waste treatment is inadequate – or, indeed, entirely absent – waste disposal sets in motion a cascade of events that reverberates across a range of ecosystems. Wastewater flows, for example, can spill onto agricultural fields and into surface water bodies. Seasonal flooding may amplify the effect as wastewater mixes with stormwater (Bahri, 2012).

IUWM approach requires efficiency, equity, and environmental sustainability, (1) water audits and efficient use, (2) water reclamation and reuse and (3) stormwater management, which includes rainwater harvesting and desalination. Some technologies may have benefits for the development of UWM: (1) natural treatment system, (2) nanotechnology and microbial fuel cells, (3) membrane bioreactors, (4) membrane technologies, (5) source separation, and (6) anaerobic fermentation (UASB).

The focus then can be moved into finding the appropriate scale to allow UWM system to make the most of every drop of water. For example, semi-centralised system has water saving potentials of up to 80% of fresh water consumption. Hence, it can help address the problem arising from water scarcity, as well as rapid urbanization.

3.2. Integrating Production Process and Urban Water Management

The designed production systems based on value chain analysis with urban water management, quality function deployment (QFD) is used. Voice of customer in the QFD is translated from the needs of the production process and answered with the technical needs of water treatment and waste water treatment.

The description of the HOQ element in figure 2 below is as follows (Temponi, Yen, & Tiao, 1998):

1. Identify What's: To identify what's or customer's attributes then necessary steps are organized such as determining customer needs, setting priorities in attributes and evaluating customer perceptions. Customer attributes (CA) is the delivery of a customer by using his own language about his desire for a product.

2. Determination of How's: Technical Requirements (TR) is a "how" in HOQ and is also called a measurable requirement.

3. Preparation Relationship Matrix: This stage is the preparation stage for the relationship matrix. With this matrix the research team will see and decide which TR impacts the CA and to what extent the impact is. The relationships that exist in TR and CA can be positive or negative, strong or weak. The value of the relationship present in the matrix will be represented by the symbol.

4. Elaboration of Correlation Matrix: Correlation matrix is the relationship between TR specified in "the roof matrix" this stage at HOQ is a stage that will help team members especially engineers.

5. Other Measures: Target Values and technical assignments are the other measurement phases in which this stage is usually carried out for cost estimation, feasibility and technical difficulties that will be faced with any changes in any TR.

6. Action Plan: Weights on TR are placed on the quality matrix. This weight is one of the outputs of HOQ.
An example that has been done is the use of HOQ in the design process for multi-variant products. The challenges that are faced are the different processes in the same commodity, still requiring the technical character of composing the components of a challenging production process. An important key in designing production processes for different products is to look for a process similarity or simplify a significantly different process (Prasetyawan & Santosa, 2017).

4. Conclusion

Based on the finding in the result and the discussion above, there are two conclusion for this research. First, an Integrated Manufacturing System Framework is needed to integrate all manufacturing aspects of maritime tourism to be sustainable. This framework considerate the manufacturing sector to support the service in maritime tourism.

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