

SDI strategic planning using the system dynamics technique: A case study in Tanzania

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Abstract

Development of spatial data Infrastructure (SDI) is a long term process, which requires long-term plans. The complexity of SDI, which is a matter of technical, institutional and financial challenges and their interactions, makes the development of such a plan complicated. It is also generally hard to convince policy-makers about the reliability of a plan and the future effect of that to get their supports. The system dynamics technique has been shown to be a proper approach for SDI planning, responding to the above issues. This paper summarizes the application of the system dynamics technique for SDI modelling in Tanzania.

Keywords: Spatial data infrastructure (SDI), the system dynamics technique, strategic planning, Tanzania.

1 Introduction

Spatial data infrastructure (SDI) is typically defined as a set of interacting institutional, technological, human and economic resources that are available for facilitating and coordinating spatial data access, use and sharing. The development of SDI in Tanzania is at the conception stage, with the preparation of a strategic plan as the ongoing step. However, preparing such a plan is a challenging task due to two main reasons. First, SDI has a dynamic complex nature [6,4] due to the variety of interactive and dynamic factors affecting the development of SDI. To prepare a development plan these factors and their interactions and feedbacks on each other should be considered and modelled. Second, the concept of SDI is still new (for inexpert) and evolving. As a result, receiving the support of policy-makers on a plan is generally difficult, where they have no insight about the results of investment on a long-term plan. Such a problem is more highlighted in a developing country, like Tanzania, where has generally limited financial resources.

Mansourian and Abdolmajidi [5] considered SDI as a complex adaptive system and then modelled the development of SDI, using the system dynamics technique, by considering the main affecting factors and their interactions in the relevant community. The model can show the growth (development) of SDI, during the time, based on today's policies. This approach is answering to both the first and the second challenges for SDI planning, mentioned above. With this mind the system dynamic technique was used for SDI strategic planning in Tanzania.

2 The system dynamics technique

System dynamics technique is a method to enhance learning in complex systems and help in designing more effective policies. It involves the usage of feedbacks, flows, states, and

time delays to facilitate the integration of the qualitative and quantitative variables operating within the boundary of the system [2,3]. The technique has been widely used in different disciplines including information technology [1]. The system dynamics technique can be used as a virtual world to simulate real situations.

3 SDI modelling in Tanzania

The development of SDI in Tanzania was modeled within three main steps as follow. First, the current status of spatial data activities and plans for the development of national SDI in Tanzania were studied, based on questionnaire survey and interview with members of the Tanzania's SDI steering committee (TSSC). Based on this study, the progress of SDI in Tanzania, with the current situation, was modeled (Figure1)

Then the model was presented to TSSC and refined by receiving feedbacks and comments. Figure 2 shows the progress of SDI within a ten year period. The overall growth of SDI is presented by a Growth index. As Figure 2 shows, within ten years SDI will progress for about 40 percent and then it does not grow any more. The main reasons of such situation were analyzed and documented.

Figure 2: SDI Growth within 10 years, based on a current situation

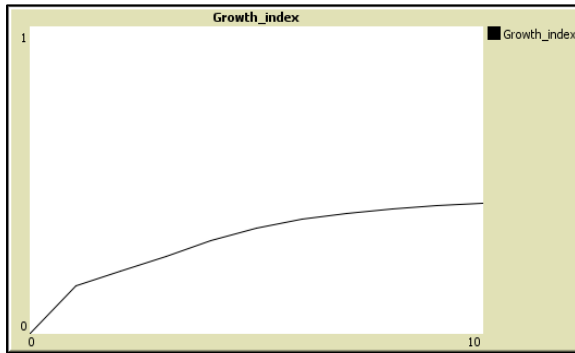
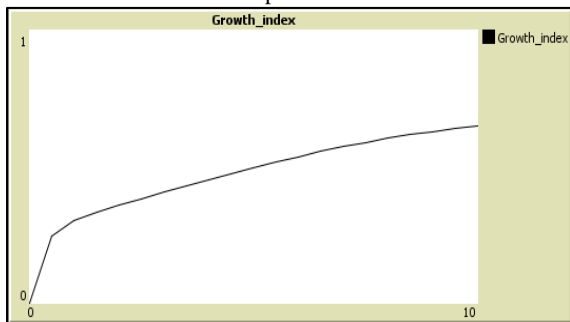


Figure 4: SDI Growth within 10 years, based on the proposed plan



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4 Conclusion

The results of the SDI development model in Tanzania were presented to TSSC in a meeting. The approach and the results were interesting for TSSC since they could clearly realize the future effect of their today’s decisions on the progress of SDI.

By changing parameters and simulating the development of SDI for different scenarios, it was realized which factors should be considered with high priorities in Tanzanian SDI strategic planning.

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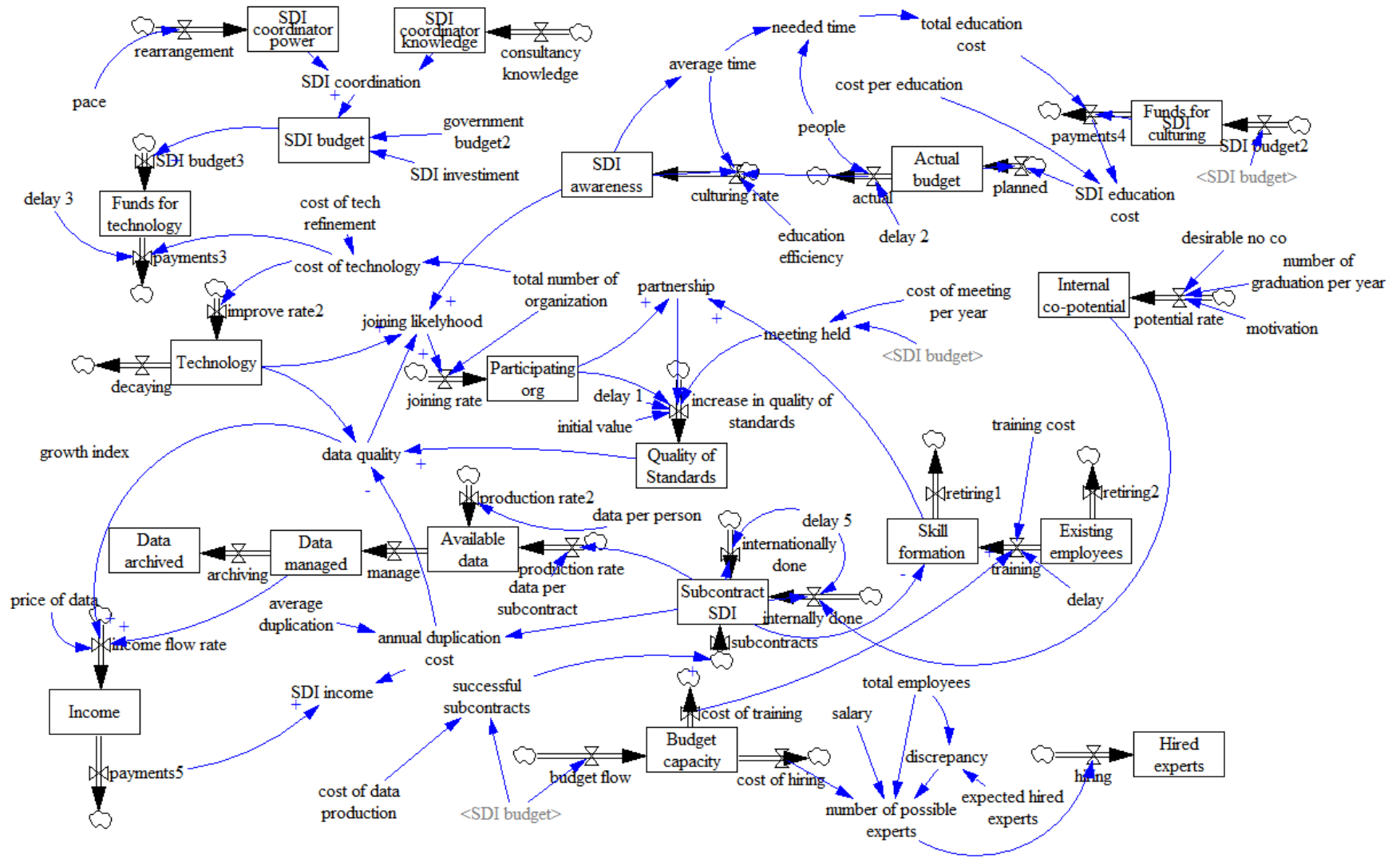


Figure 3: A system dynamic model presenting the proposed plan for developing Tanzania SDI.