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A SYSTEM DYNAMICS MODEL FOR FORECASTING SERVICE QUALITY

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ABSTRACT

With increasing expectations of stakeholders, the pressure to deliver on the Higher Education Institutions (HEIs) is immense and calls for research on the service quality at stake. Quality in general may be fitness for use but in HEIs, quality is mostly considered in terms of educational quality and administrative quality. With this background, the current study aimed at building a model of higher education sector and simulates it with various input parameters gathered from literature in varying contexts. A higher education system that can be considered to be of good quality need to meet certain requirements that include a clearly designed academic program based on a robust vision and mission. A highly motivated and action oriented pool of faculty is another important factor that enhances the quality of any higher education institute. This research tries to focus on the service quality aspects and come out with strategies that can provide the organizations with sustained competitive advantage. It was observed that to enhance the market standing and visibility the institutes must work on its visibility factor and also take steps accordingly to improve the core services that include attitude, content, and delivery. Also the simulation results indicate that HEIs must look in to managing the information sources well and knowledge creation and dissemination must be prioritized to gain competitive advantage.

Keywords: Competitive advantage, Information systems, Higher education institutions, simulation.
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1. INTRODUCTION

Higher education plays an extremely significant role in gearing up students to tackle the ever increasing day to day challenges thereby leading to holistic improvement in the thinking and behavior of people. This is extremely important for sustainable development as a whole. Education is linked with better skills, higher productivity, and enhanced human capacity to improve the quality of life as per UNESCO. Higher education plays an extremely significant role in gearing up people to tackle the ever increasing day to day challenges thereby leading to holistic improvement in the thinking and behavior of people. This leads to sustainable development as a whole. There are many tangible and intangible parameters that affect the higher education system.

A higher education system that can be considered to be of good quality need to meet certain requirements that include a clearly designed academic program based on a robust vision and mission. A highly motivated and action oriented pool of faculty is another important factor that enhances the quality of any higher education institute. With an ever increasing quest for knowledge in people and with the ease at which technology has penetrated human lives and the job opportunities that are created by technological advances has opened up the mindsets of majority of the people and people are increasingly opting for higher education either to widen their knowledge base or to strike gold with high paying companies that pay well for people with higher degrees. Higher education institutes are thus thinking of every move to attract the best students to their institute. Institutes are focusing on improving their service quality and are taking every possible step to build competitive advantage so that they remain ahead in the race and be able to attract the best students. Service quality, the outcome from the comparison that a customer makes between his expectations about a service and his observation of the way the service was delivered (Grönroos, 1984; Caruana, 2002). Service quality can lead to higher switching costs, in other words, the customer's bargaining power is weakened (Porter, 2001).

This study focused on finding out the various factors that influenced the service quality in higher education institutes. Also an attempt was made to identify the factors that influence competitive advantage in the higher education institutes. A system dynamics model was developed based on the various factors that were mentioned in the earlier literatures that influenced the core services, attitude, content, delivery , service quality gap, service quality perception, and competitive advantage and information usefulness and management. The visibility was varied at four different levels and the simulations were carried out. It was evident that it is very important to build competitive advantage and enhance the service quality.

2. LITERATURE REVIEW

A literature review of service quality, competitive advantage and building of the conceptual model are discussed here. Some of the existing conceptual models have been studied and their relevance with the current topic of study has been justified. Prakash (2018) highlighted that more and more higher education institutes are incorporating quality concepts in order to enhance the quality of learning and increase the competitive edge (Tasopoulou and Tsiotras,

2017). According to Prakash (2018), stakeholders' needs and expectations must be considered while conceptualizing quality in the case of higher education industries. Several researchers have examined the factors of ISO 9000 adoption in HEIs (Kasperavičiūtė-Černiauskienė and Serafinas, 2018). Christian (2001) states that service in itself is quite a complicated concept and it's not that easy to explain service. The term service can be viewed from different perspectives like personal service or service as a product and each perspective gives it a different meaning altogether. It is important to observe that all products can be turned in to services if the seller considers every small requirement from the customer. However, service will always be considered as an intangible entity in any context. It is a well-known fact ascertained by many researchers that a company's image is crucial in influencing the customer expectations when they think of getting associated with a brand or a company for a particular service. Figure 1 depicts the main elements of producing a service.

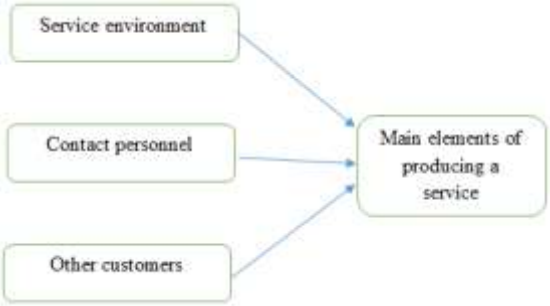

Figure 1 Main elements of producing a service

2.1. Competitive advantage

Focusing on differentiation, Porter and Miller (1985) have suggested that companies can produce differentiated products to gain competitive advantage over their rivals. This kind of competition that leads to low cost and better quality is a key to providing customers with a superior customer value (Huber, Herrmann and Morgan 2001). On the other hand several researchers have provided a unique perspective to customer retention and argue that a firm's competitive advantage could be explained by having relatively lower retention rate than its competitors. Sustainable competitive advantage is a very important factor that has been driving the investments many companies make on themselves so as to gain a strategic positioning in the market which could lead to operational effectiveness (Porter 2001). Generic competitive strategies (Porter 1998: 11) have been widely accepted as the source of competitive advantage since 1985, when Porter first created the framework.

Figure 2 Five force model (Source: Porter, 1979)

As shown in figure 2, the Porter's five force model is a widely accepted model when it comes to competitive advantage. At the center of the model is intra industry rivalry or competition inside the industry. Here the thoughts are focused on the competition that takes place inside any industry. This competition is the reason for changing several dynamics in the

industry such as price dynamics and sustainability dynamics. This competition is driven by the bargaining power of the customers and the suppliers alike at different situations and different periods. It can be observed that at some instances the customers may be having an upper hand while in some instances the customers may have the upper hand. These factors are under the threats of new entrants constantly. The newer products sometimes hold the capacity to shake up the entire industry and it can never be underestimated or ignored. Newer products change the dynamics of an already existing industry. Threat of substitute service can impact the competition in a huge way. Always the existing products or services are in constant threat because of the damage the substitute products can create. The substitute products can bring down the sales of the existing product and this can be dangerous for the firms and they may have to constantly innovate and be in a position to face the threats and emerge as a leader even in the times of crisis.

2.2. Customer Satisfaction

Customer satisfaction is a vital aspect that can play a pivotal role in building up a firm's profitability and market share. Cardozo (1965) argued that the higher the level of customer satisfaction the more likely the customer wants to make more repeat purchases and purchase other products. Anderson et al. (1994) suggested that customer satisfaction reflects a consumer's total experience in the purchasing of a product or service, and that it is an overall evaluation built up over time.

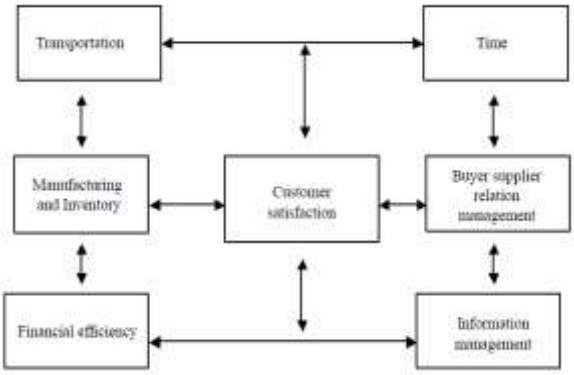

Figure 3 Model of Customer satisfaction (Source: Saad and Patel, 2006)

Saad and Patel (2006) in their model of customer satisfaction as shown in Figure 3, have demonstrated the importance of customer satisfaction and showed the importance of customer satisfaction in every step from manufacturing to the delivery of the final product. Customer satisfaction is factor that has influence on a firm's manufacturing capabilities to buyer supplier relation management to financial efficiency. Customer satisfaction has its impact on customer loyalty thereby helping in building a loyal customer base hence influencing the profitability of a firm. Be it a service or product, customer satisfaction always follows a similar trend and this model holds good in the case of service quality analysis also. According to Zeithmal (2000), The link between customer satisfaction and profits is neither straightforward nor simple and three major problems in measuring the relationship are the time lag between measuring customer satisfaction and measuring profit improvements, the number of other variables influencing company profits like price, distribution, competition etc and the fact that other variables (e.g. behavioral issues) should be included in the relationship because they explain the causality between satisfaction and results.

2.3. Information management

Alexander (2015) define information management as "the manipulation of data from multiple sources and the organization, regulation, and communication of that data to multiple audiences in multiple forms and for multiple purposes". Information management has always been an integral part of knowledge management in organizations and can act as an important element in gaining competitive advantage over the competitors.

Table 1 Comparing information management and knowledge building (Source: Alexander, 2018)

Information management	Points of comparison	Knowledge building
Externally directed	Purpose	Self-formulated
Likely constrained	Effort	Potentially expansive
Relatively brief	Residual effects	More enduring
Mainly other-determined	Evaluation source	Largely self-determined
Pervasive	Frequency	More selective

Table 1 shows the link between information management and knowledge building considered in this particular study.

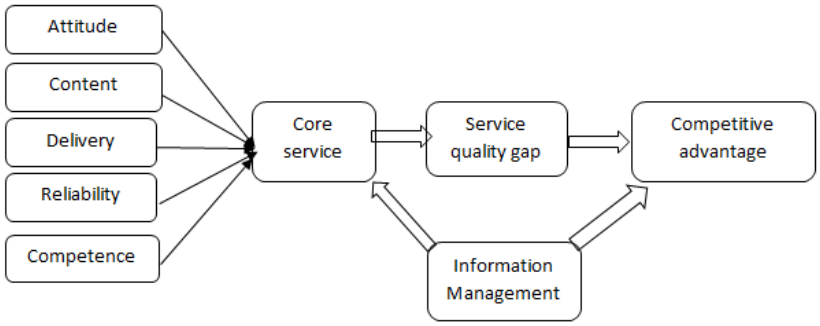

Figure 4 Conceptual model (Source: Authors)

To summarize it all, it can be said that the factors considered for this study like attitude, content, delivery, reliability and competence has as impact on the core service of the higher education institutes that eventually influences the service quality gap. The service quality gap when reduced can impact the visibility of the institute to a great extent which influence the competitive advantage without any doubt. It can be observed that customer satisfaction, which is a result reduced service quality gap can result in developing a positive word of mouth. Hence it is a must to focus on the visibility factor and improve all the intangible factors that affect the core service and undoubtedly higher benefits can be reaped. Higher education institutes are aplenty in Karnataka and in recent times the performance of these institutes has been a talking point for many researchers. With more and more competition and in a quest by the institutes to increase their intake rates, it is very evident that the institutes are focusing on the service quality aspects and making sure that the students and the faculty have all the latest facilities available for research and development and overall growth. It is vital for the educational institutes to build competitive advantage and stay ahead in the race. This research tries to focus on the service quality aspects and come out with strategies that can provide the organizations with sustained competitive advantage.

3. METHODOLOGY AND CONSTRUCTION OF THE MODEL

Several researchers have used system dynamics methodology in various fields. Kamath et al. (2013a) used System Dynamics methodology and studied TQM implementation and firm profitability. Kamath et al. (2013b) used SD in the context of manufacturing industries. Forrester (1961) stated that the objective of SD approach is to capture the dynamics

interaction of different system variables and to analyze their impact on policy decisions over a long-term horizon. This requires, first, system boundaries to be defined and a model of the system built. According to Robert (1978), the systematic procedural steps in SD modeling include the following.

- Define the problems to be solved and goals to be achieved.
- Describe the system with a causal loop.
- Formulate the structure of the model, i.e. develop flow diagrams and associated mathematical models that represent rates of change through different interactions.
- Collect the initial data needed for operation of the model either from historical data and/or from discussion with the executives/planners having knowledge and experience of the system under study. These are the initial values of all the level variables, constants, multipliers, etc.
- Validate the model using appropriate criteria to establish sufficient confidence in the model.
- Use the model to test various actions to find the best way to achieve prescribed goals.

Figure 5 indicates the factors that affect the competitive advantage. The performance factors considered are organizational commitment, job involvement, institute achievements, expected standards and employee satisfaction. Also customer loyalty, retention, and visibility are considered in this study.

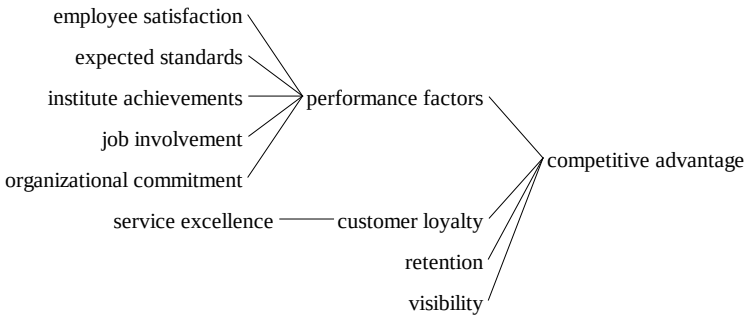

Figure 5 Factors affecting competitive advantage

Figure 6 represents the factors that affect the core service. The factors selected for this study based on the literatures surveyed are attitude, competence, content, delivery, and reliability. Attitude involves effective problem solving, healthy completion and collegial environment, and orientation towards achievement. Competence involves appropriate physical facilities, faculty's expertise, faculty's teaching ability and skills, and sufficient faculty/ support staff. Content includes clarity of course objectives, flexibility of knowledge being cross disciplinary, learn to apply, and relevance of curriculum to future needs. Delivery includes adequate and appropriate classroom, ease of contract/ access to teachers and administrative staff, and effective classroom management. Reliability includes adherence to course objectives, clearly specified value and aims, and consistency of practice.

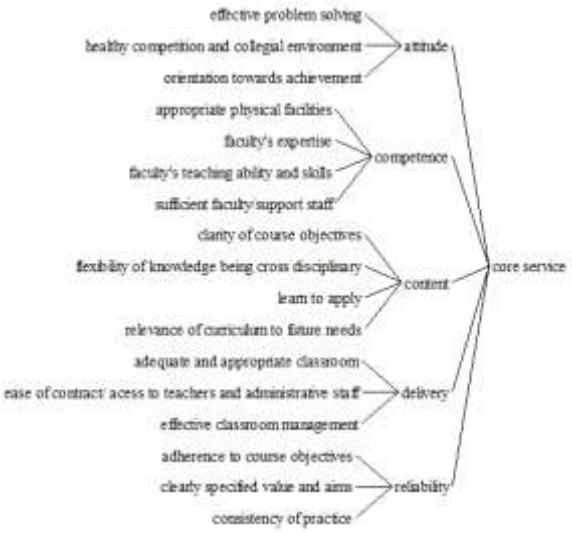

Figure 6 Factors affecting core service

Figure 7 indicates the factors that affect information management. These factors have been selected from the literature review conducted and are subjective to this particular study. The factors considered are information characteristics, information sources, information system success, and information types.

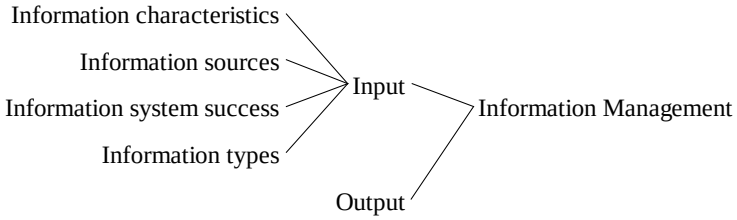

Figure 7 Factors affecting information management

Figure 8 indicates the link between knowledge and the various factors. Link between knowledge, content, core service and performance factors leading to competitive advantage and customer perception of expectation is highlighted here.

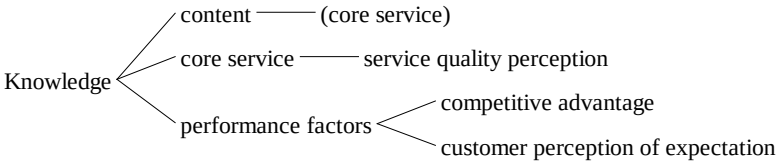

Figure 8 Relation between knowledge and competitive advantage

Figure 9 indicates the factors that affect information usefulness. Completeness, quality, relevance, and timeliness are the factors considered based on the available literature. Similarly, the importance of information quality and system quality is shown in figure 10.

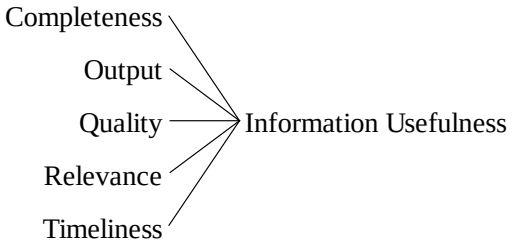

Figure 9 Factors affecting information usefulness

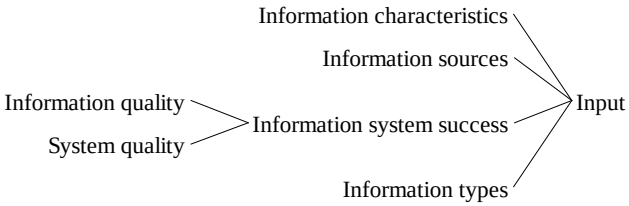

Figure 10 Relationship between quality and information management

The factors discussed in the above were studied and the cause and effect relations after analysing were converted in to a stock and flow diagram. The various parameters were connected using mathematical equations and simulations were carried out at various visibility levels and the results were compared and analysed. The stock and flow diagram in itself is not a holistic one because there are several other parameters can be considered for addition in the current model. This mode however is a small contribution topwards the development of a bigger model in the later stage.

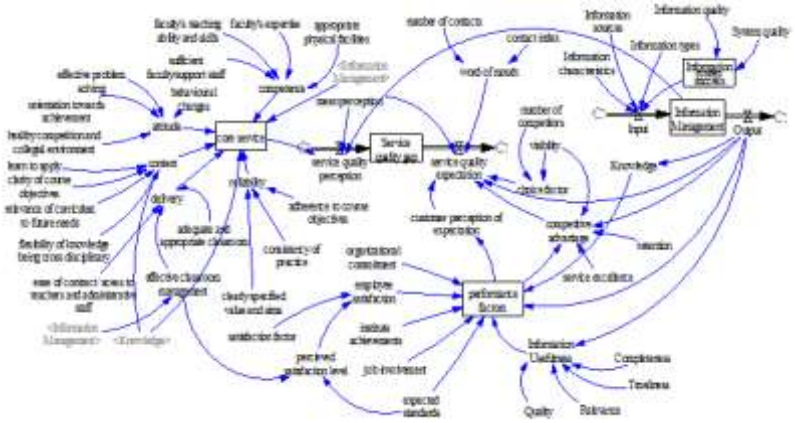

Figure 11 Stock and Flow diagram

The stocks were connected using various parameters that were found suitable during litereture review. This model developed needs to be validated. This validation can be a next part in this research. Only after validationg can one say whether this model is reliable or not. Hence validation becomes extremely important and its role in finding the reliabilityof the developed modle cannot be denied. Figure 11 represents the stock and flow diagram develped for this study.

4. RESULT ANALYSIS

The graphs generated by simulations are analyzed here. The influence of visibility on the various factors from the conceptual model developed is studied. The influence of core services on the service quality gap and service quality expectations are analyzed here.

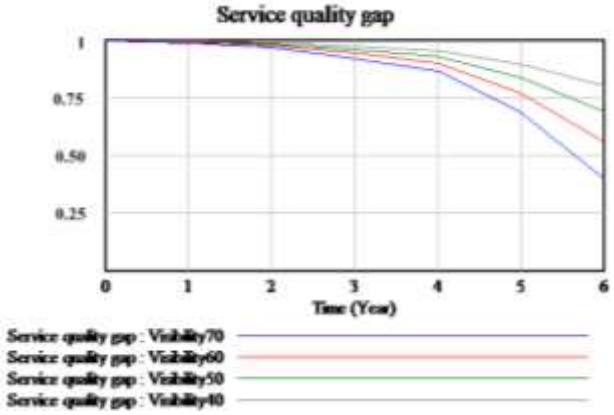

Figure 12 Graph showing influence of visibility on service quality gap

The stock and flow diagram was simulated using various mathematical equations and qualitative values as the input. The visibility of the institute was varied at four different levels say visibility40, visibility50, visibility60, and visibility70. The output of the simulation in the form of graphs is shown in figure 12. It can be observed that as the visibility of the institutes were increased from the base value to the higher levels, the service quality gap reduced to a reasonable extent. This holds well in the present business environment. With more visibility the institute can make impacts on people's minds when they are about to choose from the available options. Focusing on increased visibility the institutes can reduce the service quality gap in about four years' time. Even though the results may not be instant but over a period of time the results may be clearly visible.

Figure 13 shows the graph of influence of visibility on service quality expectation. It can be seen that people expect the service quality to go up with the increasing visibility of the institute. It is a acceptable fact that when people associated themselves with top brands or best products they expect that they would get more value for money and that is how things work in the current business scenario that is driven by high end innovation and value addition for every buck spent by the customers. Customer delight becomes more important than just customer satisfaction. As seen in the graph with an increase in visibility, over a period of time the service quality expectation also is highly influenced.

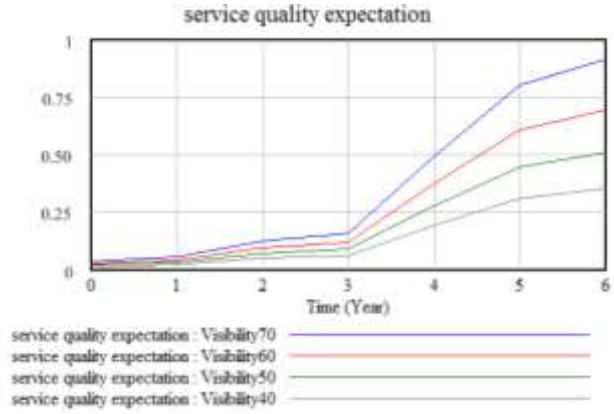

Figure 13 Graph showing influence of visibility on service quality expectation

Figure 14 shows the graph of influence of visibility on the competitive advantage. It is clearly visible that gradual increase in visibility enhances the competitive advantage significantly in a span of 6 years that were considered for simulation in this research. Even though significant increase in competitive advantage may not be recorded immediately but within a span of two years the increase in competitive advantage can be observed.

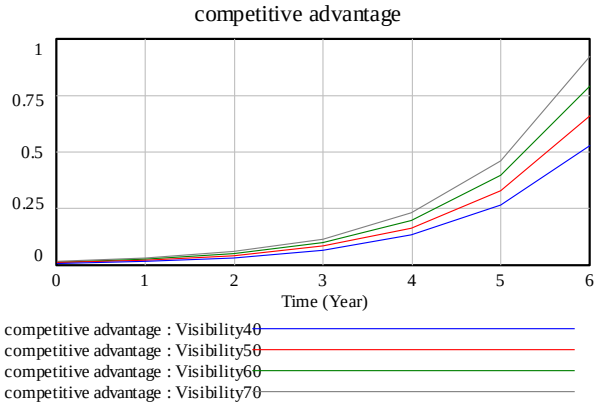

Figure 14 Graph showing influence of visibility on competitive advantage

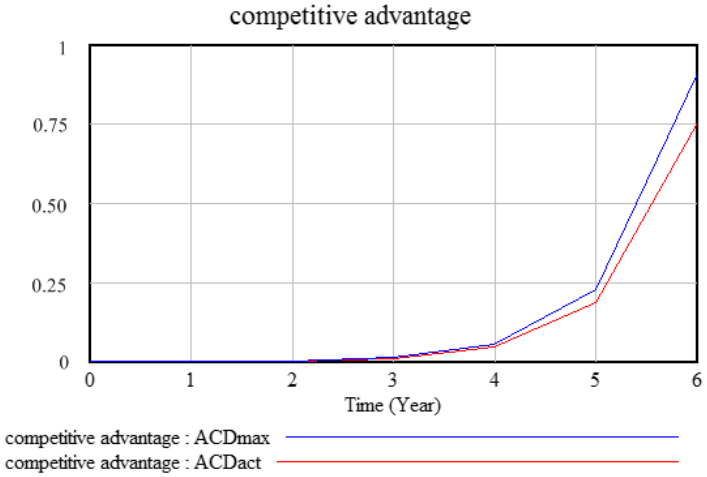

Figure 15 Graph showing influence on competitive advantage

An increase in attitude, content, and delivery influences the core services, which in turn influences the service quality gap and expectations which in turn impacts the competitive advantage. The simulation of attitude, content, and delivery influences the competitive advantage as shown in Figure 15. Even though the changes may not be visible in the first three years but with increase in time the changes can be clearly visible and the management can take steps to cash in on the increased competitive advantage and increased visibility.

Figure 16 shows the simulation results when the information usefulness was reduced. As seen, with a reduction in the information usefulness, the competitive advantage decreases steadily. Hence HEIs must make sure that information usefulness is not ignored at any point in time.

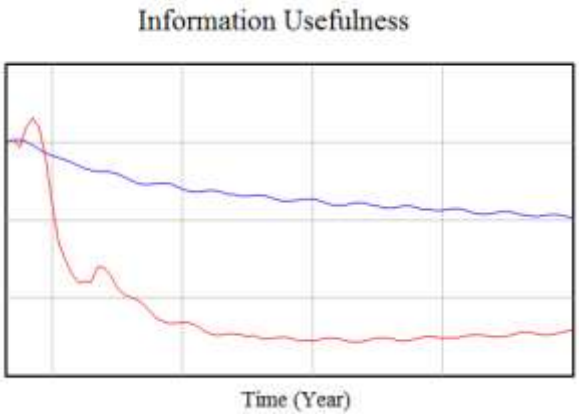

Figure 16 Information usefulness

In the second round of simulation with respect to information management, the model was run by gradually increasing the information usefulness and it was observed that the simulation results showed a gradual increase in the competitive advantage. As shown in figure 17, when the information usefulness was increased, the competitive advantage too increased. Hence HEIs must look in to managing the information sources well and knowledge creation and dissemination must be prioritized to gain competitive advantage.

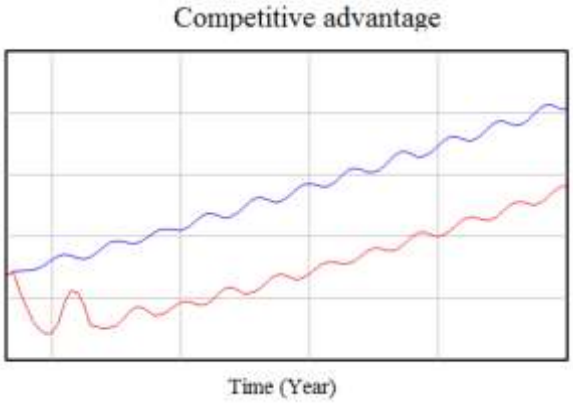

Figure 17 Graph showing influence on competitive advantage

The system dynamics model needs to be validated and only then can the discussions held here be termed valid. However the trend shown in the graph looks familiar to the trends happening in the real world scenario. However, a clear picture about the higher education institutes and their competitive advantage, core services, and service quality gap and service quality expectations may be derived only after validating the current model under consideration. Future researchers can take up the task of validating the model and also various untouched parameters from the literature review can be added to the existing model and a new dimension can be arrived at.

5. CONCLUSION

It was observed that visibility of the institute played a major role in influencing the competitive advantage. It was observed that an increase in core services helped in improving the competitive advantage and increasing the visibility. This research can help the policy makers of education institutes to draft policies that can help in tackling the competition that is ever increasing in the current business scenario. The System Dynamics model developed in this project mainly considered factors like core service, performance factors, service quality

gap, and competitive advantage. The information management systems are crucial factors that can give competitive advantage to the HEIs. Future researchers can study the impact of various parameters that affect the core services and study the many other parameters that increase the competitive advantage.

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