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Research article

Sports Entrepreneurship: A dynamic model of the fundamental economic factors in the English Premier League

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ABSTRACT

Economic factors undoubtedly play an important role in sports entrepreneurship, especially football, and fans' support helps clubs to increase their revenue and improve their financial status. The aim of this study is to systematically investigate spectator demand in the English Premier League, its interaction with the media and the effects of these variables on club revenue. Questions raised in this study deal with, as far as the variable of spectator demand is concerned, whether or not the system is in a steady state after going through a transition period. This paper studies the relationship between media attention, spectator demand and club revenue, as far as system dynamics is concerned. How the system behaves in the long run and the behavior of each system variable in the future, are other key issues of interest in this paper.

Methodology is based on system dynamics modeling. The model developed is based on data collected from the English Premier League from 1995 to 2010. The state of the system and its stability are investigated through analysis of variance and Chow test.

This study shows during a transition period, the system goes through normal stages and reaches a stable, steady state, and the system's future behavior will remain consistent; the variables of media attention, spectator demand and club revenue follow an exponential long-term trend. The application of a system dynamics approach is useful not only in exploring, revealing and understanding such significant features, but also in paving the way for subsequent studies to consider more variables introduced into model, simulating the system in a larger scope. This would allow systemic investigation of more parameters, including those affecting demand (e.g., social factors or appeal), and consequently studying system behaviors in a larger dimension. Based on the system dynamics approach presented in this paper, a multi input – multi output state space modeling of the system can be approached, in order to enable transfer function derivations, finding unstable poles in the stability analysis, stabilizing the instabilities, and system optimization. Nonetheless, nonlinear modes and behaviors of the system can also be explored for thorough system identification.

Keywords: sports entrepreneurship, dynamic systems, numerical simulation, spectator demand, English Premier League, football economics

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INTRODUCTION

Many entrepreneurs exploit opportunities through innovative marketing strategies, techniques or philosophies, and the application of this method could distinguish sports entrepreneurs from entrepreneurs in other industries.[1]

In the past decade, sport management and entrepreneurship disciplines have grown significantly. Change and innovation are key elements of sport, making sport an entrepreneurial process. In fact, change and innovation are fundamental cores of sports in the rapidly changing global business environment.[2]

The global sports industry is growing and is estimated to be worth around USD 600 billion, encompassing a wide range of associated businesses, e.g., sports manufacturing and retail, sports medicine, merchandising, media and hospitality, venues and infrastructure and tourism.[3]

Nowadays, in sports entrepreneurship, football is an international and profitable industry, and in international commerce, sports are among the exceptions in which clients pay to spectate, not to buy or consume.[31] Football is known to be one of the most important contemporary ball games.[23] This issue is important, as the role of economic factors on football is significant; it is the presence and support of fans that contribute to club income and economic improvement. A survey of 21 clubs in Brazil reveals that 8% of the clubs' income was directly earned from selling tickets.[32] Also, over 24% of the income of 10 rich, global clubs in the 2009/2010 season, was related to money earned on match days, which was directly related to the number of fans present on the given days.[33] The remaining 76% of income included televised matches and sponsors; according to a survey carried out by Baranzini et al, 2008, TV planners, financial supports and sponsors tend to choose clubs with a wide appeal.[34] Hansen and Guthier believed that fans are the major factor in the success of a football club.[5]

The purpose of this research is to systematically investigate football attendance demand in England, the nature of its interaction with the media and the effect of these factors on club income. In fact, this research investigates the current and future status of a system composed of the media, demand for watching football games and club income in the England Premier League. Thus, the research questions can be summarized as follows:

- Has the system passed through its transition period into its steady state?
- How do the three factors of media attention, attendance demand and club income relate to each other, as far as systemic dynamics are concerned?
- How does the system react in the long term, and what are the reactions the system may have in the future, are the reactions asymptotic?

These questions will be answered based on the assumption that the media, attendance, and club income are dynamic variables that undergo changes in time and have mutual effects on each other.

Methodology is based on statistical methods and common models in dynamic systems. The model proposed based on data collected from the English Premier League was investigated and simulated. The validity of the model was studied according to statistical hypotheses tests to verify the authenticity of the relationships and normality of the errors and to analyze sensitivity.

We designed the systemic model of relationships by following information presented in the literature review, we determined the mutual effect of each factor on the other. Collecting data from the English Premier League, we investigated the system's status in time, and determined whether the system is in transition period or a steady state. Minitab 16 was used to determine the relationships between variables; Vensim3 was used to simulate the dynamic system model.

LITERATURE REVIEW

Entrepreneurs allocate resources among different activities that generate a profit. Differences among entrepreneurs are not essential, but to a degree they are all profit-seekers, with the only difference found in their attitude towards innovation, and if (at each instant of time) they consider innovation as the main source of profit. Since the consequences, in terms of economic growth, are the higher the number of innovations in the economy, the higher the rate of economic growth and vice versa, policy makers should focus on stimulating entrepreneurial activity and maximizing innovation quantity.[4] Many entrepreneurs exploit opportunities through innovative approaches, and the application of this method could distinguish sports entrepreneurs from entrepreneurs in other industries.[1] Change and innovation are key elements of sport, making sport an entrepreneurial process. In fact, change and

innovation are fundamental cores of sports in the rapidly changing global business environment,[2] where the global sports industry is growing significantly.[3]

There is an interaction between sports and economics. Moreover, governments and companies, by investing in sports, can benefit from people's appeal for sports, and sport can play a role in economic development.[24] Meanwhile, *economics in sport* and the discussions related to that topic have become considerably focused on the fans' demand as the clients in the realm of sport.[6] Investigating fan demand in football was introduced by Hart et al. in 1975.[7] They investigated human and geographical factors, as well as the effect of club success on attendance demand in 4 English leagues. In the same year, Rivett, using the least-error squares, studied the effect of factors related to population and success on the average number of attendance in each season.[8] Bird, in 1982, using data collected from 1948 through 1975 from the English League, investigated the role of ticket price, time of matches, national revenues and other variables, including England's success in the World Cup.[9] Peel and Thomas studied the factors affecting attendance demand in 4 England leagues. The results show that holding a match on a holiday and the host team's possible wining influence the demand.[10] In 1994, Welki and Zlatoper fitted the attendance of every football match against 14 independent variables, including host's wins in a particular season.[11] In 1995, Dobson and Goddard considered the logarithm of number of attendance as an independent variable, introducing a regression model with 3 major variables and 9 secondary ones.[12] In 1999, Jones et al. considered 36 variables and investigated their effect on attendance demand in English Rugby competitions.[13] Falter and Perigon, in research on the French Football League, concluded that income had a negative relationship to attendance demand.[14] Following that, Forrest and Simmons, in 2002, investigated the role of probability and uncertainty of the result on the attendance demand in the English League, fitting a second-grade model including two second-grade variables and 8 first-grade variables.[15] Donihue et al. found match quality and ticket price affect attendance.[16] Price and Sen, in 2003, introduced a regression model based on the independent variable of attendance in every match, 36 dependent variables, including club championships over the last 10 years and wins in the last 11 matches.[17] In 2004, Owen and Weatherston studied the role of result uncertainty and the quality of play. They took into account 26 variables from the New Zealand Rugby League.[18] In the same year, Patton stated that factors such as reasonable price, the way tickets are distributed, good weather and quality of facilities effect attendance.[19] Baranzini's et al. research topic was based on spectator demand in Switzerland, 2009. They emphasized the role of appeal in the decisions made by TV planners for broadcasting the matches.[34] Sadeghi et al. investigated 18 factors in attendance demand. Using economic assessment methods, they concluded that football is an inferior commodity, and thus there is more demand for it in under-populated cities.[25] Elmiri and Naderian, sampling 700 football match attendances, studied the four scopes of economy, game appeal, attendance priorities and facilities on the presence of attendance in stadiums.[26] Javanmardi divided attendance demand into four factors including economic, environmental, appeal and population-geographical factors, as well as 23 variables in the 4 scopes. Investigating the Iranian Super League, they stated the appeal factor, including team success, record and club quality are among the most important factors affecting attendance demand.[20] Media can play a role in increasing attendance demand. Jackson concluded that mass media affects people's awareness.[21]

Significant research has been conducted on attendance demand, however, few researchers have carried out systemic investigations into the effect of these factors on demand. The club income, as the key factor in their survival, and the media, as an effective factor in peoples' awareness, were generally ignored.

THEORETICAL ASPECTS

A system is usually defined as a combination of elements or factors that constitute a whole by their mutual relationship and correlation to establish a certain condition or situation;[27] systemic thinking means to view the phenomena from a consistent perspective, and based on such a view, the functioning of the system depends more on how the parts interact rather than on how they function individually.[27,28] System dynamics methodology, first introduced by Forrester, is a method of studying and managing complicated feedback systems, like those present in business and other social systems. Every dynamic system that is transfigured in time consists of a four-step hierarchical structure that is capable of coming up with a structure for any change and dynamics in various phenomena.

The four-step hierarchical structure includes; closed boundary, feedback loops, level and status variables and rate variables.

In the problem-solving method of dynamic systems, feedback processes play a significant role. Generally speaking, feedback structures are the reason for changes in experience over time. The logical hypothesis is that dynamic behaviors are derived from systemic structures. Feedback refers to a situation in which A affects B and in turn B effects A, although the effect may take place in a cause-effect chain. Studying the whole system as a feedback system will help to correct the results.

The systemic dynamics model is a mirror image of real-life systems, to study the behavior of the system under different experimental circumstances.[29] Generally, there are three stages in every dynamic study of the system:

- The conceptual stage, in which the grounds and parameters of the problem are stated, the aim of modeling should be determined, the range of the system package should be clarified, and a picture of the system should be designed in feedback circles.
- The qualitative stage, in which the framework of the conceptual model is realized, and is solved by using software.
- The analysis and assessment stage, through which the results are analyzed, and with greater understanding of the problem, we attempt to solve new problems by moving to the beginning of the chain.

The behavior of dynamic systems, or what dynamic systems produce in the long run, can be categorized generally into two groups: asymptotic and non-asymptotic.[27] The aim of modeling a system is to gain a deep insight into its function, by achieving multiple feedback in different stages of modeling. The model of system dynamics uses three methods: communicative (meaning words), graphic, and arithmetic with a logical order from inexact to exact. Cause-effect diagrams are applied to give a better understanding of the structure of systems. From the diagram and the feedback loops, the pattern of system behaviors is recognized. Contrary to cause-effect diagrams, that only show the feedbacks, stock and flow diagrams can show the variables that change over time.[29]

In order to explain the function of a reflective circle, two variables are required. The first variable called *level* should constantly represent the level or the status of the system, and the second variable, known as *rate*, should represent any increase, decrease or change in the level (status).[27]

METHODOLOGY

Methodology involves statistical analysis, a case study with modeling approach and systemic analysis of demand for watching football matches in stadiums, its relationship to media attention on matches, and the effect of these factors on club income.

Application of the system dynamics approach is useful not only in exploring, revealing and understanding the main features, but also in paving the way for subsequent studies to consider more variables introduced into the systemic model. This can simulate the system with a larger scope and systemically investigate increased parameters, including those affecting demand (e.g., social factors or appeal), and consequently studying system behaviors in a larger dimension. Moreover, the system dynamics approach can pave the way for a multi input – multi output state space modeling of the system, transfer function derivations, unstable poles in the stability analysis, stabilizing instabilities and system optimization.[27] Nonetheless, nonlinear modes and behaviors of the system can also be explored for thorough system identification.

In the present study, the English Premier League was selected as the place for study and the source for collecting data. The English Premier League is the highest level of football in clubs in England, and includes 20 clubs. The league replaced Football League in 1992, which was the highest football level in England since 1888. We gathered necessary information for the model from existing data belonging to 16 England Super League seasons from 1995-6 to 2010-11, from the competitions official website.[30]

To carry out a systemic study, we made use of dynamic systems methods. To design a dynamic model for the problem, we first, reviewing the literature thoroughly, recognized how the three factors of attendance demand, media attention and clubs' income related and interacted with each other. Aiming to map the cause-effect relationships clearly and understandably. Using the ordinary system cause-effect and stock and flow diagram, and Vensim3, we simulated the model, and its long-term behavior was investigated. The simulation was carried out to study conditions of the three major variables, namely, income, attendance demand, and media attention.

Before carrying out the simulation, using a one-way variance analysis test and Chow test, we studied the system's status, as far as being in a transition period or a steady state. Thus, the time factor was tested in the variance analysis, an attempt was made to verify whether or not the time factor is significant in system changes and attendance demand. Variance analysis was used for two periods: from 1995-96 to 1999-2000 season, and from 2005-06 to 2010-11 season. The Chow test was used to examine and show any structural difference between these time periods. If the time factor is not proven to be significant, it can be claimed the system has passed through its transition period and is in its steady state.

After the primary simulation, sensitivity analysis on crucial variables of the model was conducted. To discover the relationships and equations among the variables, statistical methods such as regression and correlation analysis was performed, the verification was obtained based on the value of the correlation coefficient and normality of errors. Statistical analyses were carried out using Minitab16. All statistical hypotheses were tested at 10% error tolerance.

System dynamics methodology was used in investigating the relationship between three factors, income, attendance demand and media attention; it is capable of taking into account the mutual and simultaneous effects of these factors, as well as the loops created in the model.

In this study, we considered three factors of income, attendance demand and media attention in constructing the model. To conduct refined analysis, we also took into account two variables of a club's current situation and its past situation. The variables are defined as follows:

- Media Attention: This variable shows the rate of attention that visual media pay to the competitions. In this research, the number of broadcast matches in each season was taken into consideration as the Media Attention variable. We defined a ceiling for this variable, because it was thought that all TV channels would not normally broadcast all matches of a team throughout the season. We considered the ceiling to be at least 50 broadcast matches from a single team. This variable is represented by "Media Attention" as a rate variable in the model.
- Club Income: This parameter was investigated in two aspects: the club's annual income, and the club's total income. The variable of club's annual income was taken as a rate variable dependent upon the income arising from televised matches, rank-based super league prizes, and income earned from attendance. The variable of club's total income, which is calculated by the integral of the variable of club's annual income, was considered to be a level variable; it can also be effective in annual income, as it is effective in club investments. These variables were deducted based on data presented in annual reports of the Super League.[22] The Annual Income variable is presented as a rate variable; "Total Income".
- Attendance Demand: This variable, in analyzing the steady state of the system, is defined as the average occupied stadium capacity divided by total stadium capacity for each team during a season. However, in investigating and systemic simulation, the variable is stated in terms of two other parameters. First, the total demand of the system, which is a situation variable and represents people's demand for attending stadiums; second, the variable covers a stadiums capacity. Thus, a stadium with a capacity of 70,000 persons was taken into consideration in simulation. This variable is represented by "Demand" as a level variable, and "Stadium Capacity" as the capacity a stadium has.
- Current Situation: Based on team ranking in the season in question. This variable is studied under two circumstances. The first involves situations in which the team ranks 1-6 on the charts, and the second is related to when the team ranks 16 or 17 in the league. The aim here is to analyze system sensitivity in terms of these variables. This variable is represented by "Current Situation" in the model.
- Club's records: This variable covers points gained by the club throughout past years. This is represented by "History" in the model.

RESULTS AND DISCUSSION

Based on the literature, a dynamic system model was investigated and the cause-effect diagram of income, media attention and attendance demand was mapped (Figure 1).

According to Figure 1 and the cause-effect diagram, the following relationships for the three factors of attendance demand, media attention and income can be considered:

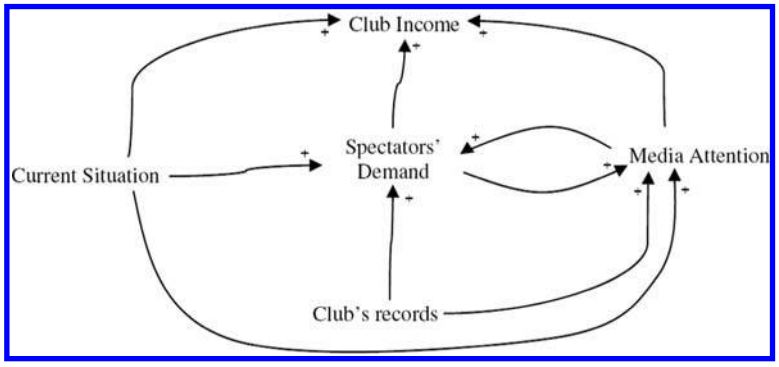


Figure 1. The cause-effect diagram of the system.

- Spectator demand is a function of club history, club status quo and media attention. The demand for a team increases as the media focus on a team increases. Also, attendances depend on club history and status quo.
- Media attention is a function of average of attendance, records, current situations and media focus more on the matches with more demand. This has been commented on in Buraimo's research.[6]
- The club's income is a function of attendance demand, media attention and team status quo. The more matches of a particular team are televised, the more income will be earned by the club due to televised broadcasting rights; also, the club's current situation will affect its income gained by Super League Prizes, known as "Merit Award".

The system can be analyzed when the cause-effect model is designed. The question of whether the system is in its transition period should be answered. To answer this, we used a one-way variance analysis and the Chow test to study the effect of time. If time is discovered to be a significant factor, it would signify the system is in a transition period. We repeated the test three times. First, it covered all data; next it was devoted to data within the 2005-06 and 2010-11 seasons; lastly the data related to the 1995-96 to 1999-2000 seasons. Using the Chow test, we investigated the structural difference between these periods. Table 1 shows the results of the tests processed by Minitab16.

Considering the results in Table 1, the test hypothesis corresponding to equality of the mean, in testing the whole data, part 1 of Table 1 and the test related to seasons from 1995-96 to 1999-2000 in part 2 of Table 1, the null-hypothesis is rejected. The value of P is less than 0.1; the factor of year in 10% error tolerance is found to be significant. From 1995-96 to 1999-2000, the system was going through its transition period. However, in the test of seasons from 2005-06 to 2010-11, section 3 of Table 1,

Table 1. Investigating the transition period of the system using variance analysis test & Chow test.

(1) One-way ANOVA: 1995 to 2010

Source	DF	SS	MS	F	P
Factor	15	1.2595	0.0840	5.12	0
Error	304	4.9832	0.0164		
Total	319	6.2427			

(2) One-way ANOVA: 1995 to 1999

Source	DF	SS	MS	F	P
Factor	4	0.1216	0.0304	2.11	0.086
Error	95	1.3691	0.0144		
Total	99	1.4908			

(3) One-way ANOVA: 2005 to 2010

Source	DF	SS	MS	F	P
Factor	5	0.0047	0.0009	0.09	0.994
Error	114	1.2124	0.0106		
Total	119	1.2171			

(4) Chow test

$$f = \frac{\frac{SSE_{total}-(SSE_1+SSE_2)}{df_{total}-(df_1+df_2)}}{\frac{SSE_1+SSE_2}{df_1+df_2}} = \frac{\frac{4.9832-(1.3691+1.2124)}{304-(95+114)}}{\frac{1.3691+1.2124}{95+114}} = 2.046$$

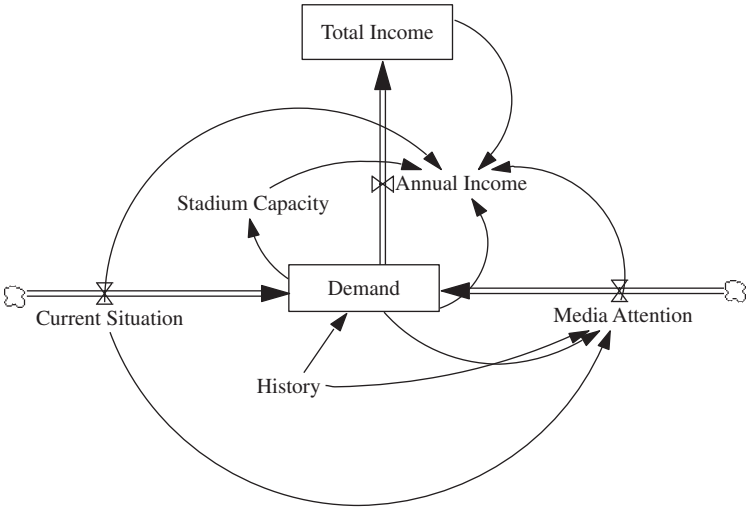


Figure 2. Stock and flow diagram of the existing system.

the value of P is considerably more than the tolerance level of 0.1. Therefore, the hypothesis concerning equality of the mean is not rejected and the difference between the means is accidental. Thus, the system from 2005 onward left behind its transition period and reached the steady state. In section 4 of Table 1, the Chow test shows structural difference between results of covariance in sections 2 and 3 of Table 1. The value of F was calculated in the 2.046 test, which is greater that $f_{.05,\ 95,\ 209}$. So, it may be asserted that the system before the 1999-2000 season was still in its transition period and started to pass through this period after 2005.

Analyzing the steady state of the system, the stock and flow diagram of the existing system was prepared and simulated by Vensim3 (Figure 2).

Using regression and existing data, relationships between variables were recognized, and system behavior was simulated for 50 years. Appendix 1 includes the commands for coding software to solve the model. The purpose of simulation was to study the behaviors of three major variables namely, income, attendance demand and media attention over time. First, the simulation was based on the assumption that a team may have had any rank on the charts throughout past years, provided it had not been eliminated; in the second step, the simulation was repeated, assuming a team may have had a high rank (1-6) on the charts. In the third phase of simulation, it was assumed the team ranked 17 on the chart. It was further assumed the team in question gained only 500 points in the league. Figures 3–8 show the results of simulation, including the three phases of simulation. In every figure, section *a*, related to simulation, involves a situation in which a team may have any rank on the charts, provided it is not eliminated from the present league; part *b* covers the information of the team ranked 1-6, and part *c* is related to a situation where the team ranks 17.

In Figures 3–7, it can be seen that club annual income, total income of all clubs, attendance demand and media attention, follow an exponential pattern in years when teams have different ranks (part a), or have achieve high ranks on the charts (part b). The remarkable point is that, in all figures, the trend and growth speed up rapidly when teams show high ranks on the charts (part b). This growth is significantly higher than when a team may have any rank. That is, the clubs reaching higher ranks each year earn more income, are more demanded and enjoy more media attention.

In Figures 3–7, part c, shows results of simulation where the team ranks 17^{th} on the charts. Based on the figures, it can be concluded that, when a team is constantly in the lower ranks of the chart, demand, income and media attention for the team will drastically decline. The remarkable point is the system's reaction to the variables, which is purposive for all variables and exponential for some. Figures 3 and 4 show club income follows an exponential trend. In Figure 5, demand shows an exponential trend, which is on the rise for clubs that have high or different ranks, but it is in decline for those in lower rankings. Demand grows as an exponential function over time. Accordingly, part a and a of Figure 6 show the stadiums capacity maximizes after several seasons, but the rate decreases for the stadiums that constantly possess low rankings, the number of attendance for such teams will fall. At any rate, this variable shows a purposive behavior. In parts a and b of Figure 7, we see that media focus,

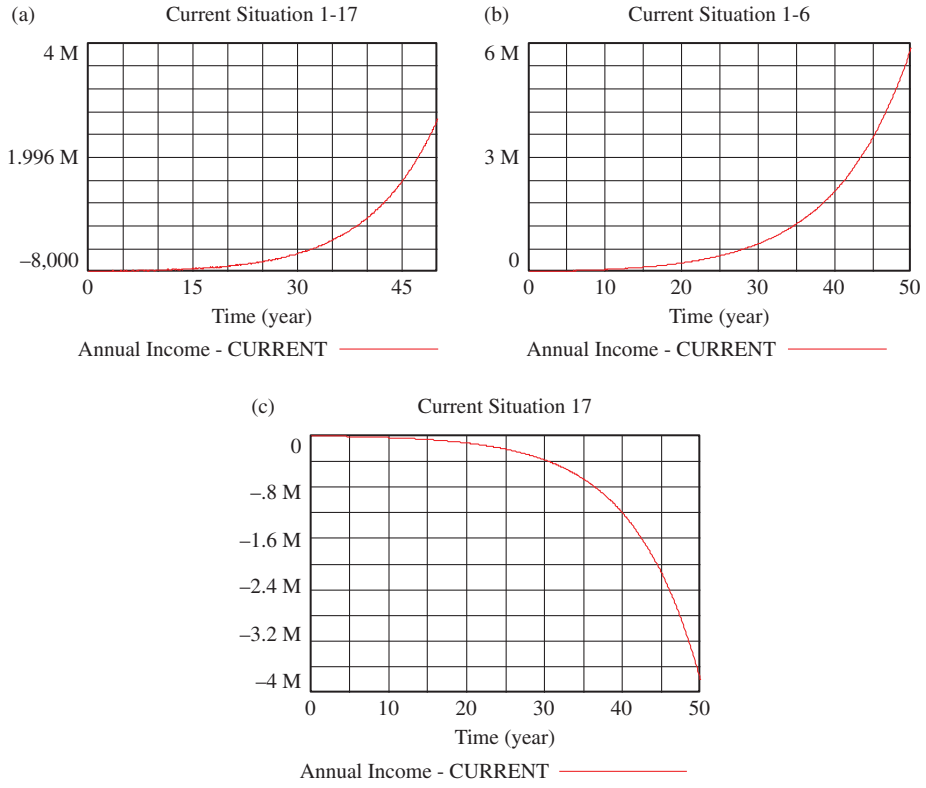


Figure 3. Investigating the trend of annual income over time (a – current situation 1-17; b – current situation 1-6; c – current situation 17).

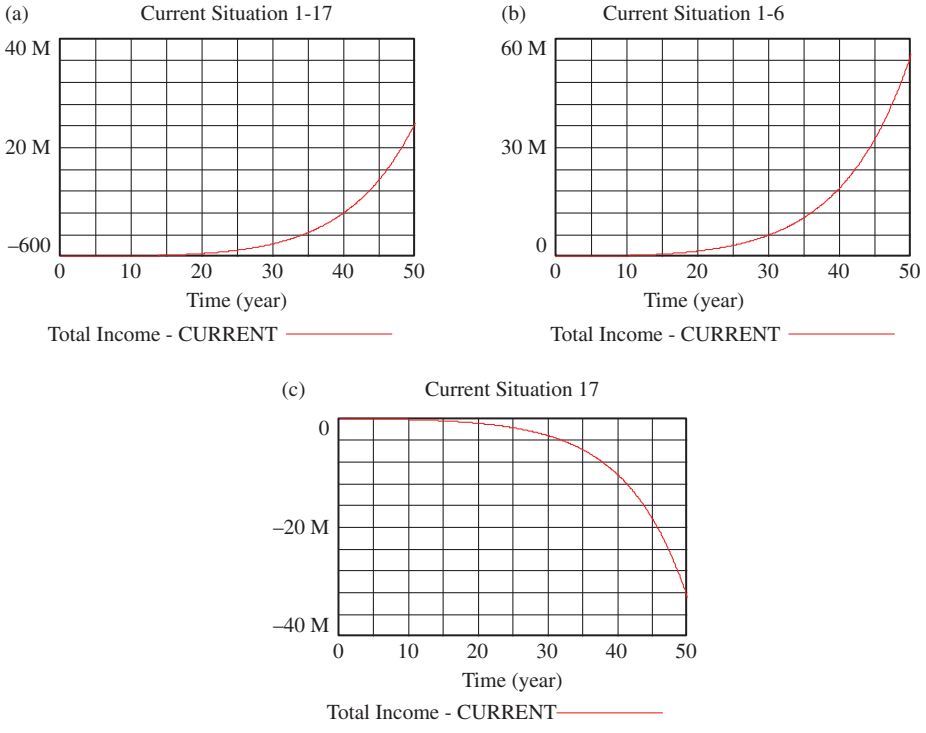


Figure 4. Investigating total income over time (a – current situation 1-17; b – current situation 1-6; c – current situation 17).

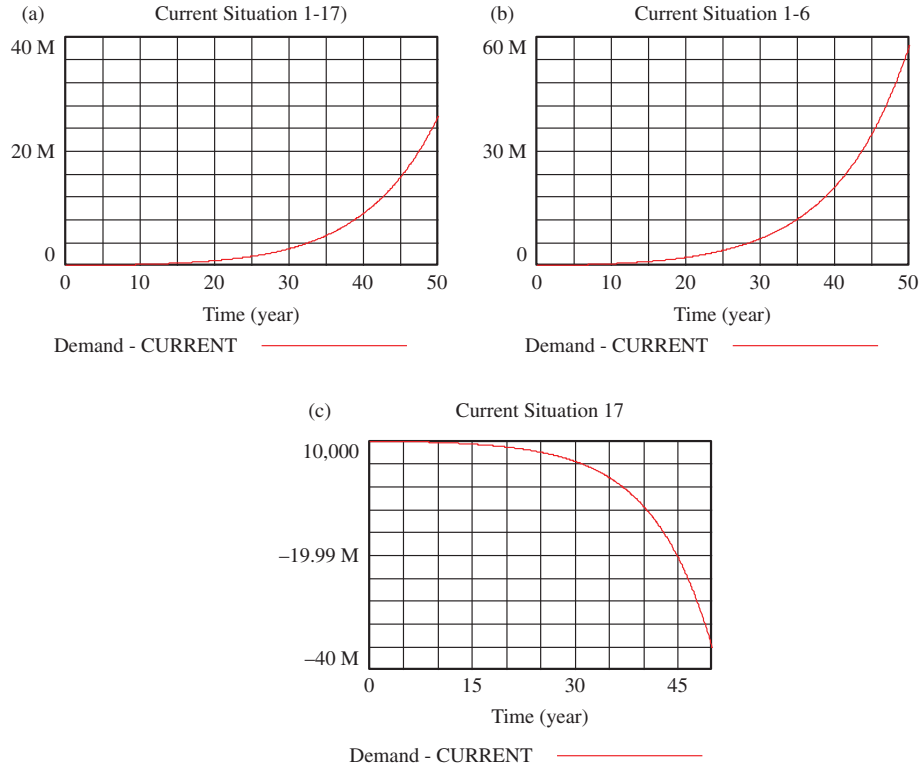


Figure 5. Investigating total demand over time (a – current situation 1-17; b – current situation 1-6; c – current situation 17).

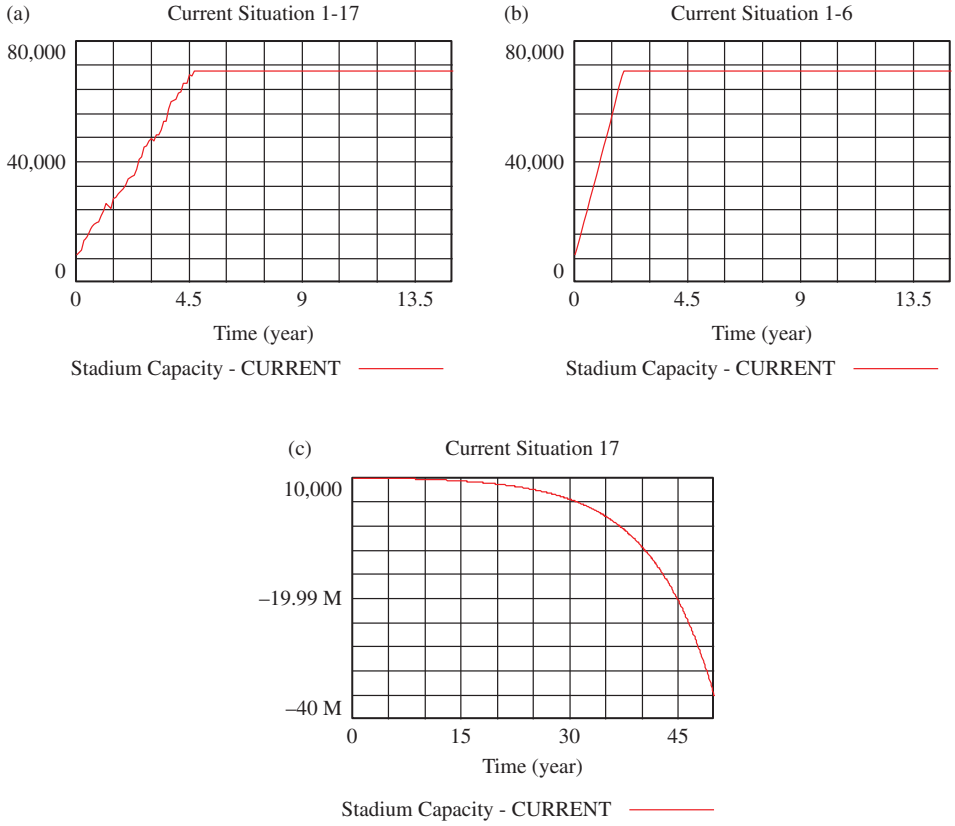


Figure 6. Investigating stadium capacity over time (a – current situation 1-17; b – current situation 1-6; c – current situation 17).

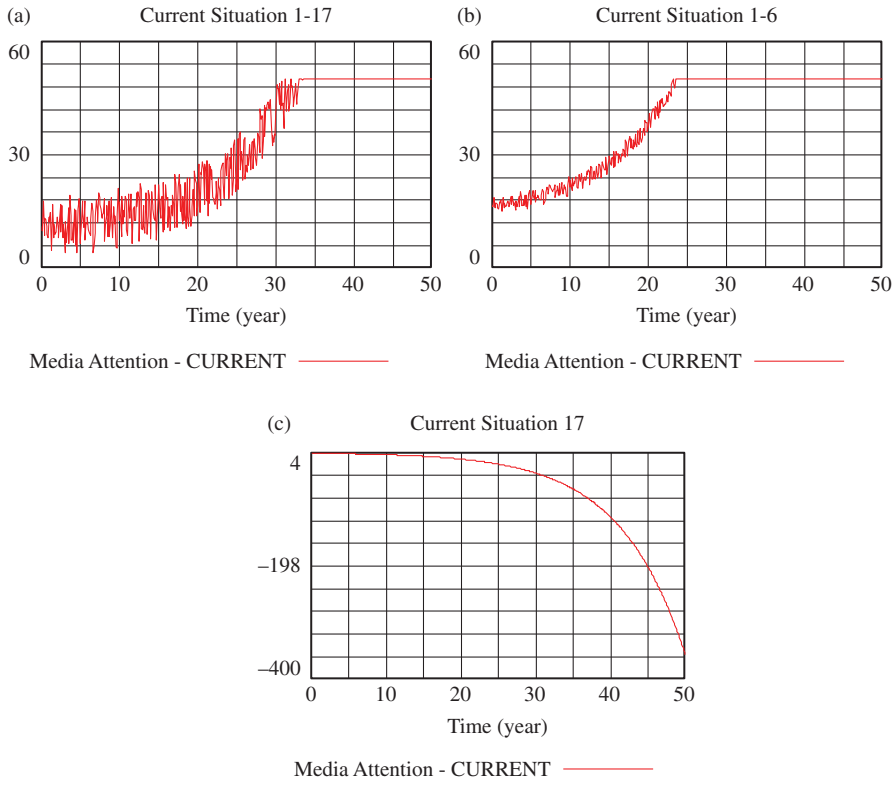


Figure 7. Investigating media attention over time (a – current situation 1-17; b – current situation 1-6; c – current situation 17).

in the long run, will be maximized, but for the low ranking clubs attention will fade away over time. Nonetheless, this variable shows purposive behavior. Overall, it can be said that the system variables show exponential and purposive growth.

Figure 8 exhibits the behavior of demand versus media attention. It shows that as media attention increases over time, the demand, although oscillatory, will gradually increase; in fact, it follows the changes in media attention, and while media attention increases, the demand takes an exponential trend.

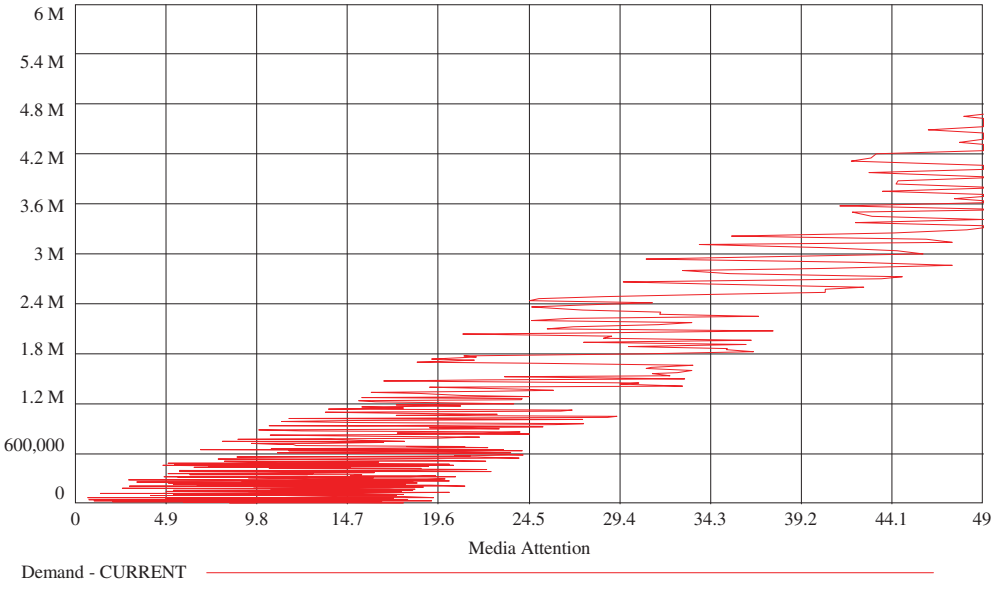


Figure 8. Investigating the behavior of demand against media attention.

Regarding the investigations, it may be asserted that the system behavior shows an exponential trend, due to its positive reflections in the relationships between variables. Moreover, according to the Chow test, the main variable in the system, i.e., attendance demand approaches a steady state in the English Premier league. However, if a team does not reach low ranks every year, the media attention for the team, its annual income and attendance demand for watching its matches can increase.

CONCLUSION

This research has applied a system dynamics approach to study attendance demand in English Premier League, the variable interactions with club income and media attention, and their corresponding behaviors. We focused on the steady state of the system, studying the behaviors of the main variable, attendance demand, throughout past years. Using the Chow test and variance analyses, we showed the system of attendance demand was still going through its transition period before the 1999-2000 season, but from the 2005-2006 seasons onward it reached a steady state. By carrying out systems simulations including the three parameters of income, media attention, and spectator demand, it was revealed the system would reach full capacity in the two dimensions of media attention and attendance demand; this capacity is in reality the capacity of stadiums. Clubs will go through their exponential course. Thus the findings can be summarized as follows:

- The attendance demand in stadiums in English Premier League has reached a steady state and has already passed its transition period.
- The three factors of attendance demand, media attention, and club income mutually interact with each other, forming a dynamic system with mutual reflections.
- The behavior of the system and its main variables, including attendance demand, club income and media attention, are purposive with an exponential growth.

The innovation in this study is the systemic study of income, media and attendance expectations, since corresponding literature had not yet taken into account the mutual effect of these parameters. In fact, a systemic approach did not appear to have been applied and the mutual effect of these parameters often ignored.

In subsequent research, more variables can be introduced into the system dynamics model, simulating the system in a larger scope, and systemically investigating more parameters, including those affecting demand (e.g., social factors or appeal), and consequently studying system behaviors in a larger dimension. Furthermore, based on the system dynamics approach presented in this paper, a multi input – multi output state space modeling of the system can be approached, in order to enable transfer function derivation, stability analysis, stabilizing unstable modes and system optimization. Nonetheless, nonlinear modes and behaviors of the system can be explored for thorough system identification.

REFERENCES

[1] Chadwick S, Gorse S, Burton N. Entrepreneurship in Sport: How Dietrich Mateschitz built the red bull empire in a day. Centre for the International Business of Sport. *CIBS Working Paper Series*. 2009;11:1–13.
[2] Ratten V. Sport-based entrepreneurship: Towards a new theory of entrepreneurship and sport management. *International Entrepreneurship Management Journal*. 2011;7:57–69.
[3] Ghosh J. Business of sports shaping a successful innings for the Indian sports industry. SCORECARD 2014 – National Conference on Business of Sports: Confederation of Indian Industry (CII). 2014:1–71. http://www.kpmg.com/IN/en/IssuesAndInsights/ArticlesPublications/Documents/Business-of-Sports.pdf. Accessed 21/11/2014.
[4] Muñoz FF, Otamendi FJ. Entrepreneurial effort and economic growth. *Journal of Global Entrepreneurship Research*. 2014;2(8):1–17.
[5] Hansen H, Gautheir R. Factors affecting attendance at professional sporting events. *Journal of Sport Management*. 1992;3(1):15–32.
[6] Buraimo B. Stadium attendance and television audience demand in English league football. *Managerial and Decision Economics*. 2008;29:513–523.
[7] Hart RA, Hutton J, Sharot T. A statistical analysis of Association Football Attendances. *Applied Statistics*. 1975;24(1):17–27.
[8] Rivett P. The structure of league football. *Operational Research Quarterly*. 1975;26(4)2:801–812.
[9] Bird P. The demand for league football. *Applied Economics*. 1982;14(6):637–649.
[10] Peel D, Thomas D. The demand for football: Some evidence on outcome uncertainty. *Empirical Economics*. 1992;17:323–331.
[11] Welki AM, Zlatoper TJ. US Professional Football: The demand for game-day attendance in 1991. *Managerial and Decision Economics*. 1994;15(5):489–495.

[12] Dobson SM, Goddard JA. The demand for professional League Football in England and Wales, 1925–92. *The Statistician*. 1995;44(2):259–277.
[13] Jones JCH, Schofield JA, Giles DEA. Our fans in the north: The demand for British Rugby League. *Applied Economics*. 2000;32(14):1877–1887.
[14] Falter JM, Perignon C. Demand for football and intra-match winning probability: An essay on the glorious uncertainty of sports. *Applied Economics*. 2000;32(13):1757–1765.
[15] Forrest D, Simmons R. Outcome uncertainty and attendance demand in sport: The case of English soccer. *Journal of the Royal Statistical Society: Series D. The Statistician*. 2002;51(2):229–241.
[16] Donihue M, Findlay D, Newberry P. An analysis of attendance at Major League Baseball spring training games. *Journal of Sports Economics*. 2007;8(1):39–61.
[17] Price DI, Sen KC. The demand for game day attendance in college football: An analysis of the 1997 Division 1-A Season. *Managerial and Decision Economics*. 2003;24(1):35–46.
[18] Owen PD, Weatherston CR. Uncertainty of outcome, player quality and attendance at national provincial championship rugby union matches: An evaluation in light of the competitions review. *Economic Papers: A Journal of Applied Economics and Policy*. 2004;23(4):301–324.
[19] Patton RJ, Factors affecting spectator attendance at men NCCA division one soccer games, United States Sports Academy, PhD Thesis 2002:139.
[20] Javanmardi E, Noghondarian K. A study of factors affecting the demand for watching football in stadiums. *Sport Management International Journal*. 2011;7(2):5–18.
[21] Jackson J. Mass participation in physical recreation. *Journal of Recreation*. 1991;49(3):33.
[22] FA Premier League. Annual Report. 2001/2002 2004/2005.
[23] Fazeli N. Representation of football or its reality? A perpective on mediasation of football in Iran. *Cultural Studies and Communication*. 2006;2(6):81–109.
[24] Ehsani M, Abudarda Z, Eghbali M. Causes of lack of sponsors to support women's professional sports in Isfahan. *Motor and Sport Sciences*. 2007;2(12):111–120.
[25] Sadeghi H, Asgharpour H, Golchinfar N. Estimation of demand function of Iran's Football Premier League. *The Economic Research*. 2009;9(3):183–202.
[26] Elmiri M, Naderian M. Factors influencing spectators' attendance in professional soccer games in Iran. *Sport Management (Harakat)*. 2009;(3):61–73.
[27] Faghih N, Dynamic Systems: Principles and Identification. Samt Publications, 2003.
[28] Faghih N, A Modern Cryptography of Change and Development in Human Systems. Navid Publications, 1995.
[29] Sushil, System Dynamics: A Practical Approach for Managerial Problems. New Delhi: Wiley Eastern Ltd; 1993.
[30] http://www.premierleague.com/page/Statistics/0,12306,00.html. Accessed 18/11/2014.
[31] Zhang J, Pease DG, Hui S, Michaud TJ. Variables affecting the spectator decision to attend NBA games. *Sport Marketing Quarterly*. 1995;4(4):29–39.
[32] Aragaki C. Result of the casual list of Brazilian football clubs-exercise 2006. *Casual Auditores Independents S/S*. 2006.
[33] Elston R, Houlihan A, Parks R, Roberts M. Football Money League. Deloitte: Sports Business Group; 2005.
[34] Baranzini A, Ramirez J, Weber S. The demand for football in Switzerland: An empirical estimation. *Haute école de_gestion_de Genève*. 2008.